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The Farce of the Chemical Foundation Suit

IN NONE of the post-war prosecutions by the Department of Justice has the government received such a decisive defeat and righteous rebuke as in the loss of its suit against the Chemical Foundation for the return of the German dye and chemical patents. The progressive collapse of the government's case as the trial proceeded last summer clearly foreshadowed Judge Morris' opinion in which he decided against the government on every contention and dismissed the suit. In fact so completely was the plaintiff's argument swept aside that there was nothing left but the privilege of appeal to the Supreme Court.

Judge Morris' opinion, which was reported in our issue of Jan. 7, reveals a painstaking review of the facts presented during a trial of 33 days and summarized in briefs containing approximately 2,000 pages. During the trial the court allowed great latitude in the presentation of evidence by both sides and in his written opinion was equally unsparing of time and effort clearly to portray the issues and lay the groundwork for a fair decision. Incidentally we may remark that the opinion is a model of good writing and remarkably free from the legal verbiage that usually clutters such opinions and obscures rather than clarifies for the layman the meaning of the court.

In challenging the power of the government to sell the dye and chemical patents to the Chemical Foundation the Department of Justice maintained that the property was sold for far less than it was worth to its original German owners. The defendant's position was that, in the disposition of enemy property, the President and Alien Property Custodian not only had adequate power under the trading with the enemy act but were also charged with the duty of considering and safeguarding the public interest. The trading with the enemy act was enacted primarily for the protection of the United States and not for the benefit of the enemy nor the conservation of his property. In the sale of the latter the statute required the President to consider the public interest, which, as the court points out, "embraces all the great public needs" and is not concerned with finances alone. Thus the "safety of the nation, the permanence of peace, the health of its citizens or the national finances" may singly or severally determine the public interest in the sale of enemy property. The trading with the enemy act, which originally authorized the sale of enemy property only for the purpose of conservation, was later amended to empower disposition in the public interest. Congress thus subordinated mere property rights to the welfare of the nation, and authorized the Alien Property Custodian to dispose of enemy property under the direction of the President "as though he were the absolute owner thereof." The plaintiff argued that the sale of enemy property under these conditions amounted to confiscation; but after reviewing early confiscation statutes the court concluded that the amendment to the trading with the enemy act was consistent with the practice of the most enlightened nations.

As for the discrepancy between the alleged value of the patents and the price for which they were sold to the Chemical Foundation, the court decided that the patents "constituted an investment of a most highly speculative character." Judge Morris shows in this part of his opinion a keen appreciation of the question of the practicability of patent processes and the investment that may be required to develop them to the point of commercial utility. Against the government's charge that the sale of the patents was made in the interest of the dye and chemical industries of this country and that the transaction was practically a subsidy to private business, the court finds nothing to sustain the plaintiff either in the facts or the law. Congress had conferred extraordinary power upon the Executive and the transaction was lawfully consummated by the exercise of that power. Discretion having been lodged in the Executive to dispose of enemy patents in the public interest, the courts are powerless to review his acts or to judge the terms and conditions of sale.

On no point was the court more critical of the plaintiff's charge than on that relating to fraud and conspiracy. After reviewing the testimony on this phase of the case Judge Morris found it "difficult to understand why the specific charges . . . were made." There was no evidential support for them. Not only that, but the defendant cleared itself from the charge of conspiracy, even though it was not obligated to assume that burden.

If the government decides to appeal its case to the Supreme Court, it is to be hoped that in the interest of all concerned and the stability of the dye and chemical industry of this country an early hearing will be held and decision rendered. Then the Department of Justice ought to apologize to the chemical industry in general and the Chemical Foundation in particular for its unwarranted interference with business. From the beginning the suit has had a strong political flavor that has been disagreeable to the business and technical organizations of the chemical industry. It smacked of insincerity and ignorance of the facts to such an extent that the public as well as Judge Morris found it difficult to understand why the charges were made. If the decision is a victory for the chemical industry, it is for the Department of Justice an ignominious defeat in which it can take little consolation.

Disastrous Demonstration Of Dangers From Dust

THE disastrous dust explosion that occurred on Jan. 3 in the Pekin, Ill., starch plant of the Corn Products Co. again demonstrates most emphatically the industrial fire hazard of dusty materials. *Chem. & Met.* has frequently given warning on this subject and has presented on numerous occasions important articles on the investigations of the engineers of the Bureau of Chemistry. However, we fear that with all the attention that has been given, there is not yet enough appreciation of the very practical necessity for careful engineering study of these problems in plant design and operation.

All the chemical industries will sympathize deeply with the company that has been visited by this disaster. It is the second serious explosion in the starch industry within a few years. One may assume, therefore, that this industry will take the lesson to heart most seriously. But the lesson is no less important for the other industries that handle materials giving rise to combustible dusts. Any one of these may suffer a similar misfortune if the very best methods for dust prevention and dust collection are not applied. Even a few days delay may be fatal. No chances should be taken in any plant.

American Industry And the Labor Market

FROM the first settlement of the land now comprising the United States, industrial development and the extension of civilization have faced the bar of labor shortage. Such shortage, involuntary in the days of colonization and, in fact, until recent years, is now the expressed desire of the majority. So that although there are too few workers to man fully all of our industries at once, even in normally good times, restrictions on the immigration of labor will be maintained and probably made more severe.

What is it, then, that happened during those years of the involuntary dearth of workers to cause such restrictions to be made so confidently? Superficially, legislation limiting immigration is at the instance of organized labor—to make its monopoly more secure. Actually, the people as a whole would never promote such an end unless it was something they themselves desired. Obviously certain benefits must follow such a course which will more than compensate for troubles due to scarcity of man power.

The answer is this: From labor shortage has developed those inventions, those automatic machines and processes and those labor-saving devices upon which the remarkable growth of American prosperity is founded. Julius H. Barnes, president of the Chamber of Commerce of the United States, gave some instances of such inventions in a recent speech before the American Economic Association. For example, in glass-bottle manufacture, one automatic bottle machine replaces fifty-four workers. In window-glass manufacture a machine blower increases production thirty to fifty times. In furnace charging, by using skip hoist, larry car and automatic weigher, two men replace fourteen. Two men unloading pig iron with an electric magnet and crane replace 128 workers. In wrapping bread, soap, sugar, yeast and other products, automatic machinery enables one operator to replace as many as forty hand workers.

These are only a few instances, but they serve to show how lack of man power, which has raised the cost of hand labor far above everything encountered in other countries, has served to stimulate the inventive mind. And because of the consequent great output of inventions, the average citizen of the United States lives in accordance with standards possible only to the wealthy of other lands. This is why real voting power is behind the demand for further restriction of immigration, and why industry must meet an ever-increasing labor shortage with the development and use of automatic machinery.

Unconscious Humor, or Anticipating the Worst?

AMONG the standard methods of adding to the gaiety of the English-speaking nations is to refer to the lack of humor of the British, from our point of view, and the lack of convention and traditional standards of opinion among Americans, from theirs. An occasional dig at such national characteristics will persist in spite of a better understanding on the part of a small proportion of either nation—those who travel—who thus can base their judgment on evidence obtained from both sides of the Atlantic and the Pacific; for it must be remembered that the Antipodes is the home of many who speak the common language of Shakespeare.

There is, however, another side to the question. The United States has been and is absorbing a considerable number of Britishers who, in course of time, accept the ideals, customs and habits of thought of the American people and appreciate the friendliness shown them here and the absence of what we consider an illogical standard of estimating personal worth. Success here comes to those who make good. British tradition, on the other hand, demands that the influence of one's ancestors and contemporaries shall play a dominant part—that gentlemen are born, not made; that culture is an acquisition rather than an attainment. This spirit, we are glad to note, is disappearing fast; and it is evident that the wall of misunderstanding between the two great English-speaking nations is being broken down surely but slowly by missionary effort. Britishers in large numbers are realizing and accepting the standards of thought that govern the American people, by foreign travel and change of national status bringing to us an understanding of underlying principles and helping us to discount the importance of surficial peculiarities. But unfortunately this missionary effort is almost all in one direction. For every hundred Britishers who become American citizens, scarcely one American makes a change of national status by adopting the old country or any of its colonies as his permanent home. Hence the average American point of view of the British is more tolerant than is the average British point of view of the American. The war and its aftermath of financial chaos has given us proof of integrity, rugged purpose and a proud idealism that persist across the water, in spite of decaying fortunes and declining world influence. The one vulnerable spot in the British armor, which gives opportunity for a friendly gibe, is the standard of humor. In other words, sometimes we believe that we can see a joke that has gone over the heads of our transatlantic or transpacific cousins. For example:

In this time of soil impoverishment throughout the world the question of cheap fertilizer is of prime im-

portance. Plant life needs nitrogen; and, to cope with the expanding needs of civilization, we must take it from the air, from Chilean caliche or from guano—to mention but a few of the possible sources. Many projects have come to light in recent years that aim to supply nitrogen in some form or other, but for flying in the face of Providence we award the palm to a South Australian company incorporated under the name of Nitrogen Limited! The story of its rise and fall contains more pathos than humor. It proposed to exploit a deposit of guano in caves. All went well for awhile, according to an Australian contemporary, until it was noticed that the guano had changed in appearance, and analyses disclosed the fact that the amount of nitrogen had decreased and the amount of calcium carbonate present was prohibitive. A visit of inspection confirmed the report, whereupon work was suspended and the company went into voluntary liquidation. Nitrogen Limited, after all, was the best company title that could have been chosen; but we refrain from accusing the directors of giving evidence of a sense of humor when they selected it.

Co-operation With The Railways

ALTHOUGH granting that industrially we are in a large measure dependent upon adequate transportation, few realize just how seriously shipping can affect business conditions. For example, there can be no doubt that the freight congestion during 1919-20 was one of the factors that brought on the depression of 1920-21. Great quantities of goods in transit were long delayed in reaching their destinations. As the consuming demand became more and more insistent, the buyers made frantic efforts to get their goods, often by duplicating orders and bidding up prices. Manufacturers thus lost all chance of accurately gaging the actual consumption of their products and naturally there was overproduction and tying up of capital in inventories of expensive raw materials. When the crash came, the only way out was the course of drastic liquidation.

Quite in contrast has been the situation during 1923, when the railroads handled a greater volume of traffic than ever before in their history. Figures just issued for car loadings show that 10 per cent more revenue freight was handled during 1923 than during the record year of 1920. It will be recalled that this was accomplished without interruption of service, without embargoes and with the minimum of congestion. The railroads themselves have been responsible for much of this improvement. They have increased loadings per car and at the same time increased the average distance traveled per car per day. Furthermore, their large expenditures on improvements have had the effect of greatly reducing the proportion of bad-order equipment.

We should not overlook the fact, however, that considerable of the credit must go to the great shipping public, to the manufacturers and other industrial shippers whose local co-operation with the railways has proved effective in many ways. They have worked together to hasten the loading and unloading of cars, they have helped to spread out coal shipments and other seasonal loads so as to avoid the annual peak that comes each fall with the movement of the crops.

It is this sort of co-operation that Herbert Hoover stressed in his address last week before the Transportation Conference in Washington. It was this co-operation, he said, that more than anything else "marks 1923 as the first year for a long time in which we have had an extremely high level of business activity and at the same time have not suffered tremendous losses from car shortages." It was his belief that "voluntary co-operative efforts should be even more definitely organized than at present and established on so systematic a basis as to make them a part of our whole transportation fabric."

This is particularly good counsel for our industries. Many of our trade associations already have traffic committees, although much of the work of these committees has been concerned with rate adjustments and negotiations with the Interstate Commerce Commission. This should, of course, be continued, but there is also room for greater co-operation with the railroads in handling the problems of seasonal shipments and the expedition of normal traffic.

Standard Code for Distinguishing Pipe Lines

IT IS a commendable practice to do little things well. In no respect is this more true than in establishing safeguards necessary to the preservation of life and property about chemical plants. One of the simplest of such measures to promote efficiency as well as safety is the marking of all pipe lines and conduits in a distinctive manner. In order to encourage uniformity in such markings throughout industrial plants the American Society of Mechanical Engineers, co-operating with the National Safety Council, has recently reported a comprehensive scheme that can be widely adopted. Definite color-material suggestions are made that are certain to appeal to those who are endeavoring to develop safe and foolproof methods of production.

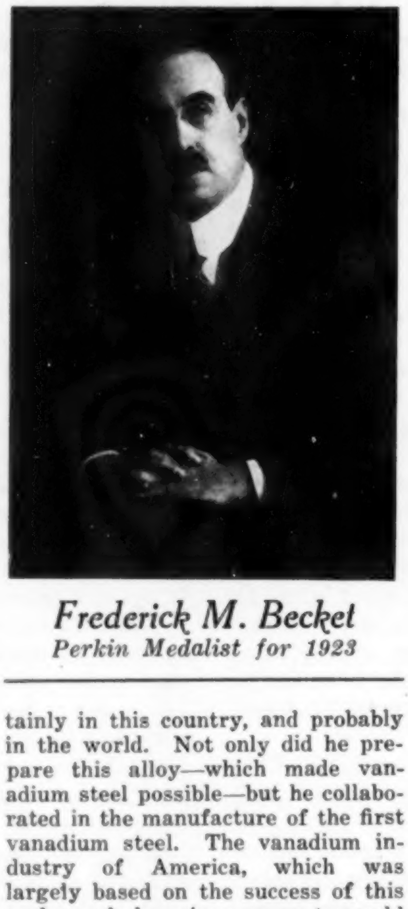
With the large variety of liquids and gases that must be handled about a chemical plant there is always a chance for mistake in manipulation unless unusual precautions are taken. That it is not safe to rely on verbal instructions and memory has been proved repeatedly in a manner that admits of no argument. Compressed air and water, for instance, must not be confused when pumping acid with an egg. Making such a mistake when handling bromine has caused at least one fatal accident. This is but a random example.

It is frequently necessary to run highly poisonous compounds side by side with those that are not toxic in any sense. To distinguish pipe lines according to the materials conveyed, five proposals have been made in the report referred to. Basing its selection of colors on the psychology as well as on the physics involved, red is suggested for fire control equipment, yellow for hazardous material, blue for protective materials, green for safe products and purple for unusually valuable materials.

The adoption of some such scheme in all plants handling fluids on a large scale is certainly worth while, and the suggestion that the same colors be made standard in all plants is sound. Workmen are constantly seeking new employment and for this reason uniform practice in different plants should reduce the accident hazard appreciably. The logic of having a color stand for an idea is manifest. A little thing perhaps, but worth while!

Perkin Medal Awarded to Metallurgist

Frederick M. Becket Attains This Great Honor for His Metallurgical Achievements, Including His Part in Developing the Industrial Uses of Chromium



Frederick M. Becket
Perkin Medalist for 1923

ON Friday evening, Jan. 11, the American Section of the Society of Chemical Industry awarded the Perkin Medal for 1923 to Frederick M. Becket, metallurgist of the Union Carbide & Carbon Research Laboratories, Inc. The choice of the members of the medal committee is lauded on every hand, for not only have they chosen the man who in their opinion has done "the most valuable work in applied chemistry," as the gift of the medal requires; they have chosen a man with such breadth of scientific knowledge, ingenuity, resourcefulness, industry and sound judgment as can rarely be found combined in one personality. Due to an unusually busy life and a modesty that has found satisfaction in successful endeavor rather than in public approval, his work has not received wide notice, but a glance through a list of the patents that have been granted him shows a career of noteworthy accomplishment.

Probably the greatest achievement of this career was the discovery and development of the process for reducing ores by silicon. The method has a wide application to ores of some of the most valuable metals and makes possible the economic production of a superior quality of low-carbon ferro-alloy, a necessity to the efficient manufacture of high-grade alloy steels. This discovery may well be ranked with that of aluminothermic reduction by Goldschmidt and is the foundation of one of the most important industries in the country. An idea of the high degree of scientific accomplishment represented by this discovery may be had from the fact that even after this process had been in successful operation for some time reputable metallurgists, unaware of this fact, were still saying, "It can't be done."

Mr. Becket was the first producer of ferrovanadium on anything approaching a commercial scale, certainly in this country, and probably in the world. Not only did he prepare this alloy—which made vanadium steel possible—but he collaborated in the manufacture of the first vanadium steel. The vanadium industry of America, which was largely based on the success of this early work, has since grown to world leadership. One of the earliest if not the earliest of producers of molybdenum by direct smelting methods, he has for years fostered this industry until today this metal promises to take a leading place among alloys for the production of superior engineering steels.

He was a pioneer worker on ferrosilicon and has contributed largely to the scientific knowledge that has brought this industry to its present important position. The same may be said of his early connection with the calcium carbide industry. His work in these two industries has been in a large measure responsible for placing these American products in the forefront as regards purity and quality.

When, during the war, the need for zirconium as a constituent of light armor plate became urgent, the government turned to this distinguished metallurgist as the most likely man to develop new methods that would bring production of this refractory metal to the necessary large volume with little delay. The government's faith was justified. Becket succeeded after 4 months of untiring effort, so that before the armistice was signed the only limitation to the rate of production was the availability of the ore.

It is impossible here to touch more than the high spots of Becket's achievements. We have mentioned a few of the most general importance. Let us speak of just one more. It is the part that he has played and is playing in developing the utility of chromium. It is almost impossible to exaggerate the importance of the place that chromium is taking in the industrial world. Its peculiar and almost invaluable properties, especially when alloyed with certain other metals, are bringing it into truly spectacular prominence now that we are learning how to overcome the difficulties that for years impeded its utilization. And Becket had no small part in overcoming these obstacles.

A typical case of particular interest to chemical engineers is presented by those chromium-iron alloys that are coming into such prominence as resistants to corrosion and high-temperature oxidation. These metals, which contain about 30 per cent of chromium, presented great difficulties both in their manufacture and in subsequent manipulation. Under the deft and strong hand of Mr. Becket many of these obstinate wrinkles have been smoothed out and the chemical engineering industries are provided with a new and most valuable material of construction.

Certain-teed Products Plant at Richmond, Calif.

Making Felt From Waste

By A. W. Allen
Assistant Editor, *Chem. & Met.*

This article describes the operation of a plant that absorbs waste fabric of all descriptions from foreign and domestic sources. With the felt manufactured is incorporated a byproduct of Californian petroleum refining—asphalt. A layer of mineral surfacing and a backing of mica are afterward added. The finished product is sold in several grades, in form of rolled sheets and also as shingles of various classes and colors. The recent conflagration at Berkeley, a city within a few miles of the plant described, and the subsequent passage of municipal legislation there prohibiting the use of wooden shingles on roofs, have served to stimulate interest in fire-retardent substitutes. In appearance and durability the felt-asphalt-mineral covering equals or excels many other types of roofing material, being neat and possessing the desirable quality of "staying put." As an example of the utilization of waste and byproducts, the success of the industry in question is another example of technical advance in an age of progressiveness.

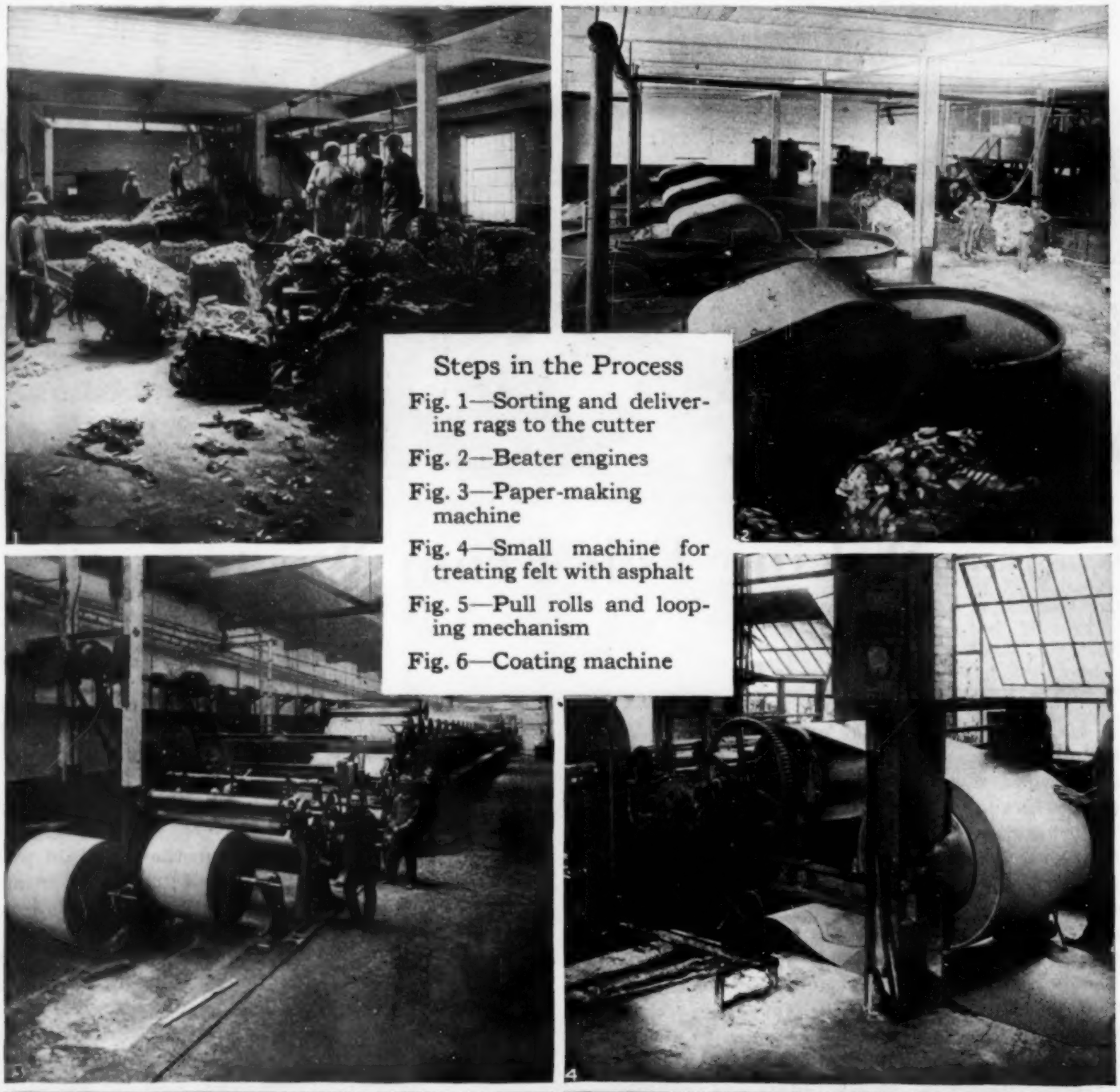
THE United States plays a frugal rôle in at least one phase of world economics—in providing covering for buildings as well as for humans, and using the same material twice over. Not content with supplying most of the cast-off clothing that goes to Europe and the Orient, domestic ideas of economy and efficiency are such that the tatters and remnants that survive are eagerly bought by manufacturers of an ingenious type of roofing.

Rags, waste paper, old clothes, sacking, bagging and other miscellaneous fibrous material—these are the discarded products of commerce and domesticity that form the basis for the manufacture of prepared roofing at the Western plant of the Certain-teed Products Corporation, at Richmond, Calif. It is usual to maintain a considerable stock of raw material on hand; at the time of my visit there, in October, the reserve amounted to more than 1,000 tons.

The plant is operated continuously. Waste of a cotton, hemp or jute base is delivered first to a cutter, which discharges to an elevator, in the trough of which the operator makes a daily haul of treasure. In spite of the care shown by the original owners of coats and pants, in spite of the diligent searching of the rag pickers and other middlemen, by whom the discarded garments are sorted and classified, coins are found with surprising regularity. The income from this source, the perquisite of the man in charge of the cutter, averages about \$3 per day. One lucky find netted him three gold watches; another made him the proud possessor of a diamond ring!

The cut rags, or the waste paper and magazines, are fed to what is known as a beater engine. This apparatus consists essentially of an oval trough, about 2½ ft. deep, which is separated by a division extending part of the longitudinal distance and serving to insure continuous circumferential flow. In passing around the trough, the pulp comes in contact with a large roller, which incidentally maintains movement and circulation; its main purpose, however, is to effect disintegration, being equipped with sixty-six knives that engage, when the drum is lowered, with six other knives in the bottom of the trough. The operation of reducing the material to fiber form takes about 1½ hours with rags and 1 hour with paper, the beating engines being operated on the batch system.

The product of the beating engine is delivered to a sump, thence passing to the suction of a two-throw, 10x20-in. plunger pump, with ball valves, known in the industry as a stuff pump. After passage through two jordans for further disintegration, the pulp flows in a trough to a sump, from which it is elevated by a second pump. After dilution with water, the stock is screened by being pulled through a perforated plate by the suc-



Steps in the Process

Fig. 1—Sorting and delivering rags to the cutter

Fig. 2—Beater engines

Fig. 3—Paper-making machine

Fig. 4—Small machine for treating felt with asphalt

Fig. 5—Pull rolls and looping mechanism

Fig. 6—Coating machine

tion produced by rubber diaphragms. The undersize is delivered to a Horne paper-making machine, with a capacity of about 40 tons of dry finished product per day of 24 hours. The wet end of the machine is equipped with a continuous blanket conveyor. Solid matter in the stock deposits on the faces of the two cylinders covered by fine screening. The water passes through the perforations, suction being maintained at intervals by the gravity fall of the escaping water through the trunnions of the cylinders. This operation leaves a layer of stock on the cylinder, being held in place by a second roll on the inside of the blanket, to which it is transferred. The thickness of the layer of stock formed is determined by the speed at which the blanket conveyor is made to travel. At the Richmond plant, eighteen varieties of felt are made. A blanket, of pure white wool, lasts about 2 weeks and costs about $110.

One of the most interesting features of the process is seen in the adoption of closed-circuit methods of handling the water used. The plant is situated at a considerable distance from San Francisco Bay; salt water might have been used, but it was desired to avoid corrosion and other troubles in the plant. The sinking of wells resulted unfavorably. The closed-circuit method was therefore evolved by the company's engineers, and has given complete satisfaction.

The excess water from the cylinder in the paper machines passes to a settling sump outside the building, divided by baffles into three sections. The dirty water passes through these in series, provision being made for bypassing the flow when a compartment is being cleaned out, which merely involves opening a plug cock and sluicing the accumulated material into the sewer. The overflow from the last section of the settler is pumped to the storage above the beater room.

The mat of fiber formed in the wet end of the paper machine, after passage over a vacuum box to remove excess moisture, is given a slight compression between rollers. It is then taken off on a second blanket, for primary drying, afterward passing to steam-heated cylinders. Auxiliary drying is insured by the provision of jets of heated air, which are deflected onto the surface of the paper as it passes between rollers, the capacity of the machine being thereby greatly increased. The fan used to supply air is driven by a steam engine, the exhaust from which passes through radiators placed in the duct leading to the hot-air delivery pipes. This equipment was supplied by the J. O. Ross Engineering Corporation, of New York.

A paper mill is usually situated alongside a river or creek or near the ocean. The water used, contaminated with finely divided material, is discarded. In this plant, the water remains in closed circuit, being re-used indefinitely. The success of this new development in practice should encourage the erection of paper and felt mills at points where operations can be performed most economically, irrespective as to whether excess water is available or not. It also draws attention to the dependence of general technical progress on the utilization of unit-process apparatus developed by the chemical engineer. Mechanical equipment for the settlement of the sludge in such plants, and filters for the clarification of the overflow, are likely to find useful application in the paper and felt industries.

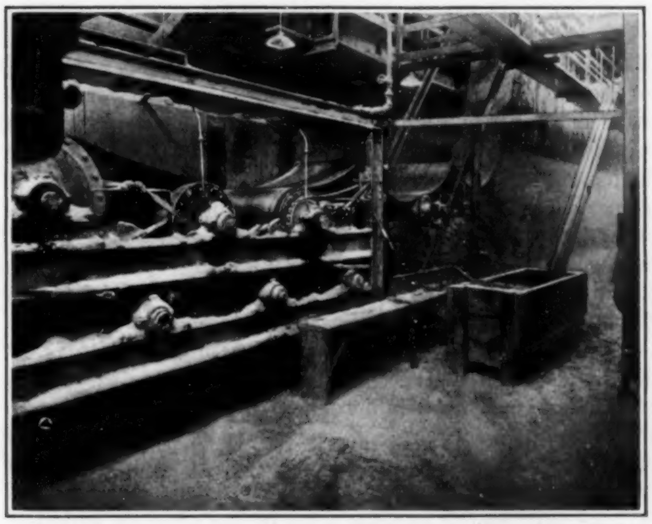


Fig. 7—Finished Product Going From Cooking Rolls to the Loop Storage

The paper is delivered at the end of the machine in roll form, 72 in. wide, and is cut into rolls each 36 in. wide. A small part of the product is sold thus without further treatment, being used for sheathing and sound-deadening purposes. By far the larger proportion, however, is manufactured into roofing and shingles. A double treatment with two types of asphalt is given, the first to penetrate the stock, the second to provide a coating that will insure the adhesion of the crushed mineral used for surfacing and protect the saturant from drying. A small machine, used for the manufacture of lighter grades of asphalted felt, consists essentially of steam-heated pull rolls, submersion tank, press rolls, drier rolls and winder. The larger units are equipped with a looping system, whereby storage is provided when a new roll of felt is being put in position. After passage through the saturator tank, as it is called, the treated felt passes between two steam-heated press rolls, the excess asphalt being returned to the tank. A second loop system is provided for drying and storage. The grading of the material, assuming the uniformity of the felt used as a base, is determined at the Certain-teed plant according to the amount of asphalt absorbed during the penetration stage. Each roll of felt is weighed before and after submersion treatment, the increase recorded providing the correct datum for the classification of the ultimate product. By this plan a continuous check is kept on the treated felt that goes to make up the highest grade of roofing; if a breakage occurs during saturation or drying, any pieces torn off to facilitate sewing are added to the finished roll, and the gross weight is taken. This method has proved the best to insure proper grading; it is difficult to regulate the preliminary absorption treatment to effect the retention by the felt of a predetermined maximum of asphalt.

A small amount of the treated felt is sold thus, without surfacing, being used by contractors for built-up roofs. The bulk of the asphalted product, however, goes to a machine for the manufacture of prepared and surfaced roofing. The roll of felt is placed in an unwinder, then passing to a looping contrivance, then between two rolls, the lower one being partly submerged in liquid asphalt of a special character, so as to coat the lower side of the paper. The asphalted surface next passes under a distributor, by which an even layer

of talc or slate—depending on the kind of roofing being made at the time—is applied. Beyond this point the other surface of the felt is similarly treated with talc or ground mica. The product then passes between pressure rolls, by which a smooth and even facing is produced, then around water-cooled rolls. An automatic device delivers it in loops for cooling, after which it is passed to the winder, is examined, weighed and packed for shipment. When shingles are to be made, the coated felt from the cooling loops passes to a cutting machine, by which single or multiple-style shingles are produced.

Three classes of mineral surfacing are used in making either slate-surfaced roll roofing or shingles. Each of the minerals used is screened to pass a 10- and rest on a 35-mesh screen; composition and sources are as follows: Red—slate from Vermont; Blue-black—slate from Pennsylvania; green—slate from local (California) sources. The mica used in the plant is supplied by the U. S. Mica Co. The talc used for coating a variety of smooth-surface felt, also manufactured by the company, comes from El Dorado County, California. It is ground at the plant to pass a 30-mesh screen.

For permission to visit the plant we are indebted to the Certain-teed Products Corporation; and acknowledgment is also made to L. A. Pockman, the manager at Richmond, and S. C. Straub, of the general manufacturing committee, New York, for information and sundry courtesies that permitted the compilation of these notes.

Examples of Graphitic Corrosion

BRITISH authority estimates the present annual wastage in iron and steel at nearly three and a half billion dollars, according to Alfred D. Flinn, director of the Engineering Foundation, who describes recent engineering research in the effort to eliminate the ravages of softening iron through graphitic corrosion. Important revelations in this field have been made in a report to the foundation by J. Vipond Davies of New York, president of the United Engineering Society, which comprises the four big national organizations of civil, mining, mechanical and electrical engineers.

"Millions of tons of cast-iron have been put under ground and under water in pipes, tunnel linings and other engineering structures. It has been observed that certain kinds of soil and water act upon some kinds of cast iron, slowly softening them so that the objects can be cut with a pocketknife. Sea water, water in alkaline soils and water percolating through fills containing some kinds of chemical wastes may thus attack iron.

"Twelve years ago J. V. Davies encountered the problem. Not finding sufficient information, he began an investigation. Meanwhile other engineers and scientists have been working on graphitic corrosion and much knowledge has been gained. Mr. Davies has presented a valuable statement on his findings to the Engineering Foundation.

"The historical branch of the study has brought out many interesting facts. In 1836 wrought-iron guns were raised from the 'Mary Rose,' an English man-of-war, sunk by the French in a fight near Portsmouth in 1545. These cannon were of iron bars hooped with iron rings and were all loaded. The cast-iron balls, which should have weighed 30 lb., actually weighed only 19¼ lb., and those which should have weighed 70 lb. weighed only 45. Their appearance was like that of regular shot until, on being exposed to the air, they became red hot and fell to pieces.

"In 1822, cast-iron cannons belonging to a pirate vessel sunk about a century before off Holyhead, Wales, were raised. Although soft when first recovered, they hardened upon exposure to the air, and when King George IV passed through Holyhead on his way to Ireland a little later these old guns were used to fire salutes. It is said that they gave louder reports than any other guns.

"Cast-iron guns from the 'Florida,' one of the Spanish Armada, sunk in 1588, were raised in 1740. On scraping away the corroded surface, they became so hot they could not be touched. A ship surgeon who was consulted as the most learned man at hand could explain this phenomenon only by the supposition that since the vessel had gone down in the heat of action, the guns had not yet cooled! They had been at the bottom of the sea 152 years.

"Other striking examples could be cited. Cast iron affected in this way has been found along our coasts, in tidal marshes, in the alkaline soils of Manitoba and in many other places. Some of the phenomena mentioned are due to well-known facts. The 'gray' cast iron, the kind most readily attacked, contains several per cent of carbon by weight. Being much lighter than pure iron, the carbon is a considerable proportion of the bulk of the casting. The carbon is not dissolved by the salt or alkaline water which slowly eats away the iron. Hence, although the dimensions of the casting may remain unchanged, its specific gravity and its weight will be reduced.

Interesting Facts Discovered

"Mr. Davies exposed many samples of iron under various conditions for periods of 1 to 5 years. Some samples were completely graphitized in one year; others in close proximity were little affected in the longer periods. This corrosion was found to have no relation to electrolysis by stray electric currents, but to be due to action within the metal itself, to direct electrochemical process. In the situation where the experiments were conducted the graphitic corrosion was traceable to the injurious action of the water percolating through the soil in which the specimens of iron were buried. Exhaustive electrical surveys proved that there were no stray currents present.

"The distinctive action is due to a great number of tiny battery cells made up of the particles of iron and carbon in the casting, the alkaline or salt or slightly acid water serving as the electrolyte. Contacts with metals lower in the electromotive series or stray electric currents hasten the action. 'White' cast iron, containing less graphite, is but little attacked. Cast irons high in silicon are non-corrosive. Unfortunately they are brittle, are difficult to melt and cannot be machined. As a consequence they are not used in engineering structures.

"Protective measures consist of keeping the electrolyte (injurious water) away from the surface of the casting or of neutralizing its action. Failing in these, if the castings are of a kind of iron subject to attack, one can only follow the practical example of the circus man who exhibited a lion and a lamb peacefully occupying the same cage and found it necessary occasionally to renew the lamb."

Importance of Dissociation of Chemical Compounds in Steel Making

Observations on the Use of Carbonless Alloys for Introducing the Alloying Metal Into Steel Show the Significance of Chemical Dissociation to Metallurgists

BY J. KENT SMITH
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IT IS often said that there is no need to use some particular "carbonless alloy" because the amount of carbon which the usual ferro-alloy will introduce into the steel being made is well within the permissible limits. I wish to point out in this paper that not only is the amount of carbon present of importance, but also the dissociation of the carbide which is present is a vital factor.

The term "carbonless alloy" must not be interpreted too literally. It conveys the method of manufacture, not the carbon content. Metals are reduced from their compounds by the presentation of a substance which, under the existing conditions, has a greater affinity for oxygen than has the metal to be reduced. In most cases the deoxidizing substance presented is carbon. Some metals, in the circumstances which must prevail at the time of reduction, have considerable affinity for carbon; hence one or more carbides are formed in the ferro-alloy of the metal. Some metals have a greater affinity for carbon than have others; while with some, stable carbides cannot be formed under the most intensive conditions.

By Way of Definition

A "ferro-alloy" is an alloy of iron with a large percentage content of some other metal. It is used for the purpose of adding this other metal as an alloying metal to the molten steel in a steel-making furnace. A "carbonless alloy" is a ferro-alloy produced by some other method than the reduction of the essential metal from its ore by heating with carbon.

Copper, tin and lead, for example, can be reduced from their oxides by means of carbon without the reduced metals containing a trace of that element. On the other hand, if titanium, vanadium, molybdenum, chromium, manganese and many other metals are reduced from their oxides by carbon and concurrently melted, the reduced product will contain a considerable amount of chemically combined carbon.

Consequently, if it is desired to produce these metals or their alloys with low carbon content, the reduction is carried out by other means. Two of the most favored reagents for this purpose are silicon and aluminum. Metals reduced with carbon may actually contain a less percentage of carbon than those made with other reducing media, yet the latter are called "carbonless" because of the manner in which they are produced.

It is worthy of note that reduction by aluminum or silicon is really electrical reduction "once removed." In this case we do not directly reduce a metal from its oxide by carbon, because of its avidity for carbon. But we reduce electrically by means of carbon some other metal more avid for oxygen, but with little or no avidity for carbon, and use such metal as our reagent in the ultimate reduction. In other words, we can attain our end in two stages, and it is impossible of attainment in one stage. That, however, is a note by the way.

The question of the actual carbon content of an alloy may involve some very important factors besides that simple arithmetical one which alone is generally considered. The dissociation of chemical compounds is a matter of temperature. Some dissociate at low temperatures, others only at very high ones. Most of the carbides met in steel making dissociate at some temperature well below that incidental to good practice. But carbon may form one or all of several possible carbides with some metals, and this is where the trouble lies. One particular carbide of a given metal may dissociate very differently from another differently constituted carbide of the same metal. And if the dissociation of the more "difficult" carbide be incomplete in the temperature zone incidental to good steel making, trouble will arise.

I shall cite the cases of vanadium and chromium. The strength of the steels containing these elements —apart from the toughening action of the former—is due to their containing a properly distributed carbide. This homogeneous carbide is formed on the cooling of the simple solutions. But if one of the carbides in the raw material charge has not dissociated, the carbides in the steel product will be unbalanced and they, in common with the carbonless portion of the metal, will be permeated by minute particles of the undissociated carbide. Not only do we get degradation of our product, due to the unbalance of the main composite carbide, but we get degradation in a still greater degree due to interspersion of those carbides, beside which particles of graphite would be comparatively innocuous.

Again, one of the greatest desiderata in any ferroalloy is its ready solubility in the molten metal to which it is added. The solubility of an alloy and the dissociation of its components must be interdependent, since the undissociated carbides are incapable of entering into true solution. Thus the presence, in a steel-making alloy, of carbides undissociable at "steel temperatures" enhances the difficulties attending its use.

This may be well illustrated in non-ferrous practice. If we take a ferromanganese, a product of the coke-air-blast furnace, and attempt to prepare from it, in a "brass-hole," a commercial copper-manganese alloy containing 25 per cent copper, the results of our labor are negative every time. A ferromanganese of this type always contains a large proportion of carbon united with the manganese in practically regular proportion. It is known from long experience that exactly the same ferromanganese is readily soluble in molten steel. No carbide of manganese has yet been found that does not dissociate at a temperature very considerably below the temperature of the steel bath, as micro-analysis shows. Such a ferromanganese can be incorporated with copper in a very hot-working hole. But, if the carburetted ferromanganese is replaced by one of the same percentage prepared by an aluminothermic process, its incorporation with copper to the desired extent can be accomplished without difficulty in a low-temperature hole. The explanation undoubtedly is that carbide of manganese does not dissociate at the lower temperature.

Practical Application

In problems of practical steel making we may have to consider questions of similar relativity. Many of the ferro-alloys the use of which in the steel trade is making such rapid strides are particularly prone to contain certain carbides which are dissociable only at very high temperatures. Particularly would I instance the ferro-alloys of molybdenum and chromium. In fact, I say deliberately that in my opinion nothing has so delayed the widespread application of molybdenum as a steel-making alloy as has the deliberate ignoring of dissociation problems. The too generally expressed opinion of steel men has been that while undoubtedly the benefits to be derived from the application of molybdenum to steel are immense, such application has proved irregular as to its results. And one dissatisfied user may deter scores of potential users. Molybdenum itself has not been to blame in the slightest degree for the disgruntled user's experiences with it; the real trouble lies in the fact that a wrongly made ferro-alloy has been used.

I do not for one moment claim that all the carburetted alloys of those elements that may form carbides dissociable only with difficulty necessarily contain those carbides. Some do, others do not; hence irregularity. If the laboratory can definitely assure us that a carburetted alloy does not contain them, its use is permissible where the ultimate analysis of the desired product admits it. But if the laboratory cannot give us such a pronouncement, then I say that on the simple principle of insurance, we must use the carbonless alloy if we wish to attain regularity of result.

The objection most frequently urged to the use of carbonless alloys is that they are more costly. Even if we admit their market price to be somewhat higher, their costliness in use does not necessarily follow. Cheapness in first cost by no means always—in point of fact, rarely—spells economy; decreased rejections of finished product and regularity of excellence may easily more than counterbalance it.

In fine, the moral is that although our knowledge of the intricacies of steel manufacture has been immensely extended owing to the labors of the chemist and physicist, we still do not take a sufficiently detailed view of all its problems. The inclusion of considerations concerning dissociation can help us one step further.

How Various Woods Resist Decay

To show as well as possible the relative durabilities of various untreated woods the Forest Products Laboratory, Madison, Wis., has prepared the following table from the service records and information it has collected. There are not enough records in existence on some of the woods to be conclusive, and the durability figures given should be accepted only because they are based on the most complete service data anywhere obtainable, supplemented by observation and expert opinion from many sources. They are subject to correction whenever authentic service data show the necessity. The durability of commercial white oak is taken as 100 per cent.

Conifers	
Cedar, eastern red (juniper)	150–200
Cedar, southern pine	80–100
Cedar, other species	125–175
Cypress, bald	125–175
Douglas fir (dense)	75–100
Douglas fir (average mill run)	75–85
Fir (the true fir)	25–35
Hemlock	35–55
Larch, western	75–85
Pine, jack	35–45
Pine, longleaf, slash (Cuban)	75–100
Pine, Norway	45–60
Pine, pitch, sugar	45–55
Pine, shortleaf	60–50
Pine, southern yellow (dense)	80–100
Pine, western white	65–80
Pine, white	70–90
Pine, western yellow, pond, loblolly, lodgepole	35–90
Redwood	125–175
Spruce, Engelmann, red, Sitka, white	35–50
Tamarack	75–85
Yew, Pacific (western)	170
Hardwoods	
Ash	40–55
Aspen	25–35
Basswood	30–40
Beech	40–50
Birch	35–50
Butternut	50–70
Catalpa	125–175
Chestnut	100–120
Cottonwood	30–40
Elder, pale	25–35
Elm, cork (rock), slippery	65–75
Elm, white	50–70
Gum, black, cotton (Tupelo)	30–50
Gum, red	65–75
Hickory	40–55
Locust, black	150–250
Locust, honey	80–100
Magnolia, evergreen	40–50
Maple	40–50
Mulberry, red	150–200
Oaks, red oak group	40–50
Oaks, white oak group	100
Oak, chestnut	70–90
Osage orange	200–300
Poplar, yellow	40–55
Sycamore	35–45
Walnut, black	100–120
Willow	30–40

Black locust and osage orange are the most durable of the native woods. When exposed to conditions that favor decay, they will probably last almost twice as long as white oak, and from three to four times as long as red oak. Bald cypress, redwood, catalpa and most of the cedars are also highly durable species. Douglas fir, longleaf pine, the white pines and western larch average only a little less durable than white oak. Hemlock, the true firs and loblolly, lodgepole and western yellow pines fall considerably lower.

The sapwood of practically all species has a very low durability.

New View of the

Old Dutch White Lead Process

Account of Experiments That Seem to Upset the Accepted Theory of the Fermentation of Tan Bark in the Stacks

By Frederick W. Shaw
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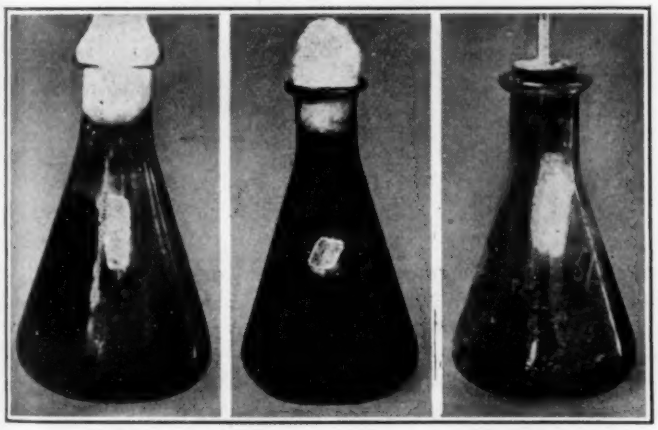
WHITE lead—that is to say, basic carbonate of lead—is probably the most important of the white pigments, yet the actual mechanism of its production by the old Dutch process has never been clearly explained. For example, the factors that cause the tan bark to ferment have long been in controversy.

For the benefit of those unfamiliar with the process it may briefly be recalled that the materials used consist of pure refined pig lead, acetic acid and a mixture of new and spent tan bark. The tan bark as it is received from the tanneries is prepared for use by mixing various proportions of the new bark with the spent bark. This mixture is thoroughly moistened with water and allowed to stand in a heap until heat is given off. Pure refined pig lead is cast into perforated disks, termed buckles, of approximately 6 in. in diameter, and weighing about 8 oz. A corroding house with a base of 25x50 ft. is made ready by spreading about 18 in. of prepared tan bark on the bottom and setting the corroding pots side by side. This leaves about 18 in. along the outer walls which is used for banking or sealing the bed. The wells of the corroding pots are filled about two-thirds full with 3 per cent acetic acid and the lead buckles are suspended above the acid. Vent pipes are placed in position, the layer is capped with boards, covered with tan bark, and the operation repeated until the house is full.



Figs. 1-3—White Lead Formation Under Varied Conditions

Fig. 1—Non-sterilized tan bark, showing the formation of basic carbonate of lead after 40 days. Fig. 2—Sterilized tan bark; 40 days. Fig. 3—Tan bark moistened with 5 per cent phenol; 40 days.

Corrosion of the metallic lead starts promptly and continues for about 90 days. During this time the beds are kept under constant observation, corroding being controlled by valves on the vent pipes. The cycle of chemical change which takes place during corrosion consists of:

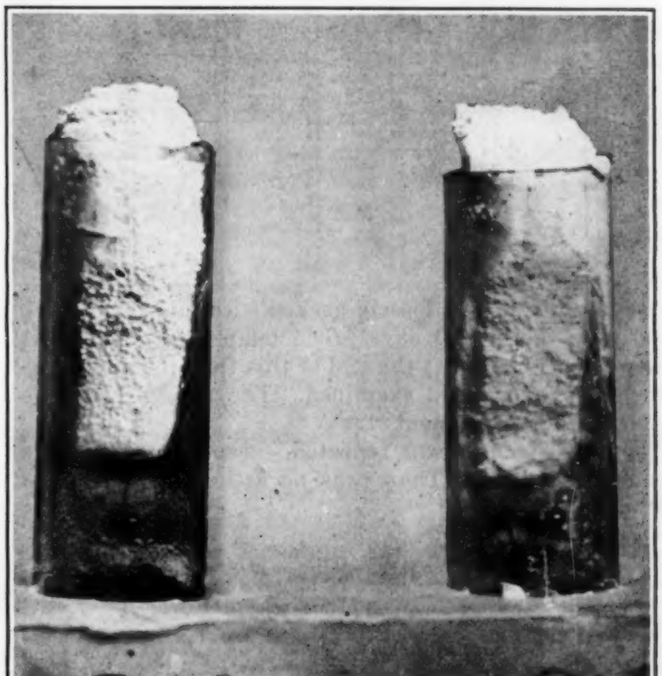
1. The formation of a thin film of hydrated lead oxide on the surface of the lead buckles.
2. Corrosion of the hydrated lead oxide into basic lead acetate by the acetic acid vapors.
3. Conversion of the basic lead acetate, in the presence of water vapor and carbon dioxide, into basic carbonate of lead.

After corrosion is complete, the white lead is crushed and screened for the removal of any of the unconverted lead, mixed with water and ground through French buhr mills. It is then delivered to a flotation process, where coarse particles are removed and reground, pumped into jacketed copper drying pans, thoroughly dried, taken from the pans, pulverized and packed as dry white lead.

Is an Organism Responsible?

Various micro-organisms, including protozoa, yeasts, mucors and bacteria, have been isolated from the tan bark and it has been suggested that the production of carbon dioxide was due to their activities.

This investigation was begun on the assumption that



Figs. 4 and 5

Left—Vial and lead strip from flask containing sterilized bark; 40 days. Right—Vial and lead strip from non-sterilized bark; 40 days.

the fermentation was due to a thermophile (i.e., a heat-loving bacteria) but was discontinued after several months' labor because experiment revealed that heat was not a necessary factor in the production of white lead, except perhaps in hastening the reaction. This was followed by the assumption that the organism was not a thermophile and that the reason for the production of the carbon dioxide during the time of high temperature of the stack was due to the enzymes of the bacteria. The numerous micro-organisms isolated included thermophiles, mesophiles, aërobes, anaërobes, spore formers and non-spore formers. These appeared to be associated with the production of carbon dioxide from the tan bark, because basic lead carbonate was formed after the inoculation of sterilized tan bark with any of these organisms, the acetic acid and lead being in their proper positions. But the sterilized controls also produced basic carbonate of lead in approximately the same quantity as the inoculated flasks. It was at this juncture that the following experiments were begun:[1]

Attacking the Problem

1. Several small boxes (6x6x6 in.) were loosely packed with moist, mixed tan bark, in the center of which was a dish containing 3 per cent acetic acid. A piece of lead buckle was suspended above the acid. After 30 days, during which time the temperature inside of the boxes was from 2 to 3 deg. below room temperature, the boxes were opened and examined. The lead was covered with a thick, white coating of basic lead carbonate.

2. A large box (36x6x6 in.) which contained ten 50-c.c. beakers, each with 3 per cent acetic acid and the suspended lead, was loosely packed with mixed tan bark and observed for 30 days. The temperature record is shown in Table I. At the end of this time the apparatus was taken down and examined. The results were the same as in experiment 1.

Table I.—Temperature Record in Experimental White Lead Production

Day of Experiment	Room Temperature 8 a.m.	Noon	4 p.m.	Box Temperature 8 a.m.	Noon	4 p.m.
1	..	24	..	..	20	..
2	23	24	23	20	20	20
3	23	23	23	20	20	20
4	24	23	24	20	20	20
5	23	24	23	20	20	20
6	23	24	23	20	20	20
7	23	24	24	20	20	20
8	23	24	24	20	20	20
9	23	24	24	20	20	20
10	23	24	24	20	20	20
11	23	23	23	20	20	20
12	22	23	24	19	19	20
13	23	23	24	20	20	20
14	24	24	24	20	20	20
15	24	25	24	20	20	20
16	23	23	23	20	20	20
17	24	23	24	19	19	19
18	23	24	24	19	20	20
19	24	24	24	20	20	20
25	23	24	23	20	20	20
30	23	24	24	20	20	20

3. Experiment 1 was repeated, except that the acetic acid was omitted. There was no action on the lead in 30 days.

4. Experiment 1 was repeated, except that cotton was used in place of the tan bark. The lead had a small amount of lead acetate on the margins at the end of 30 days.

5. Durham fermentation tubes containing dextrose bouillon were inoculated with spent tan bark. These tubes showed acid and gas production when incubated as high as 50 deg. C., but not at 60 deg. This is not in agreement with Grieg-Smith, who found a sugar-splitting bacillus in spent tan bark, which would function at 60 deg. Morrison and Tanner did not find a sugar-splitting thermophile in their work on the aërobic thermophiles from water. Veillon has reported some anaërobic thermophiles which form gas in dextrose media.

Fig. 6

Vial and lead strip from flask containing sterilized bark; 20 days. Note the action on the cut edges of the lead.

6. An Erlenmeyer flask (150 c.c.) was partly filled with mixed tan bark covered with water, then sterilized at 15 lb. steam pressure for 15 minutes. After removal from the sterilizer, the water was poured off and a sterile vial containing 3 per cent acetic acid, with lead suspended above the acid, was placed in the flask. Lead carbonate began to appear on the lead in 24 hours, and was of an appreciable amount at the end of a week. This flask was kept at 22 deg. C.

7. Six Erlenmeyers were used in the repetition of experiment 6 except that two of the flasks were sterilized at 30 lb. steam pressure. The results were as in experiment 6.

8. Six Erlenmeyers were used, containing tan bark moistened with 5 per cent phenol in water, and the vials with acetic acid and lead. The results were as in experiment 6.

9. Experiment 8 was repeated, except 10 per cent formalin was substituted for the carbolic acid. The results were as in experiment 6.

10. Filter paper was substituted for the tan bark in experiment 6. The results were almost negative. There was but a slight action of the acetic acid on the lead.

11. In this experiment the tan bark was moistened

[1]The technique used in these experiments, except as noted, was as follows: Dry bark, mixed, spent or new, as noted in experiments, in units of 35 grams, was placed in 150-c.c. Erlenmeyer flasks, the bark covered with water, the flasks stoppered with cotton or with a rubber stopper through which projected a small piece of glass tubing in which was a cotton plug; a small glass vial and a piece of lead buckle for each flask were added, and the whole was sterilized under steam pressure. After sterilization, and when the apparatus had cooled sufficiently for handling, the water was poured off the bark, the vial put in place by the use of sterile forceps, the acetic acid placed in the vial with a sterile pipette and the lead put in place by the use of sterile forceps. That is, the flasks, unless otherwise noted, were handled according to standard bacteriological methods. Unless noted to the contrary, the incubation temperature was 22 deg. C.

with 3 per cent acetic acid and the lead suspended above the bark. The results were as in experiment 6.

12. Unsterilized and sterilized tan bark was moistened with chloroform and the acetic acid and lead added as in experiment 6. No lead carbonate was formed.

13. Ether was substituted for chloroform in experiment 12. The results were as in experiment 12.

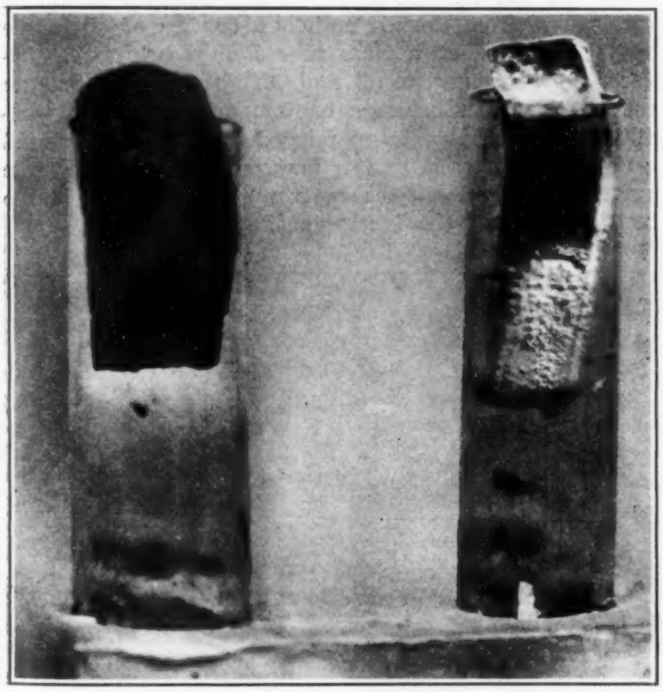
14. Fifty per cent ethyl alcohol in water was substituted for chloroform in experiment 12. The results were as in experiment 6.

15. Water manometers were attached to the flasks in experiments 7, 8 and 9, and the apparatus was kept at constant temperature. The manometers showed a diminishing pressure within the flasks.

16. Acetic acid and lead were exposed to the air of the laboratory during these experiments. There was a slight trace of action on the lead.

17. Manometers were attached to flasks containing unsterilized, moist tan bark, but no acetic acid and lead, and kept at constant temperature. There was no change in the water level.

18. This experiment was a repetition of experiments 7, 8 and 9 with the exception that the admission of air was controlled by a stop-cock. The action on the lead ceased within a short time after the supply of air was cut off, but started again upon the admission of air.



Figs. 7 and 8

Left—This figure shows the lead before use in the experiments. Right—Vial and lead ; 5 days.

19. Eight Erlenmeyer flasks were prepared with moistened tan bark, acetic acid and lead, but not sterilized, and two flasks incubated at 50 deg., two at 60 deg., two at 65 deg., and two at 70 deg. Lead carbonate appeared on all of the lead strips. Culture tubes containing nutrient agar slants inoculated with tan bark infusions showed no growth while kept at 70 degrees.[9]

20. Three flasks were prepared with unmoistened tan bark and kept at 22 deg. At the end of 2 weeks the results were negative.

21. Two flasks were prepared with unsterilized, mixed bark, 3 per cent acetic acid and lead, and the bark submerged in water. No lead carbonate appeared in 30 days.

The contents of the flasks in experiments 6, 7, 8 and 9 were cultured and found to give no growth in and on the ordinary laboratory media.

The outstanding criticism relative to the experiments would seem to the writer to be that the stacks used in commerce develop a great amount of heat, a stack sometimes showing an internal temperature of 85 deg. C. It is readily seen that the "stacks" used in the foregoing experiments were too well ventilated, or that the exposed surface was too great, for the volume of the bark to retain the heat, so that conduction to the surrounding atmosphere was greater than in the commercial stack.

The use of sterilized bark and the use of bark moistened with antiseptics would appear to be conclusive that micro-organisms play no rôle, or but a minor one at least, in the production of carbon dioxide from tan bark. Also, the production of basic carbonate of lead at temperatures higher than that at which cultures could be obtained would seem to eliminate the biological factor or factors. Water and oxygen are necessary, as shown in experiments 11, 12, 13, 14, 15, 18 and 20.

During some of the preliminary work on this problem it was noticed that some of the lead strips were not attacked uniformly. These strips were removed, the surfaces scraped and the lead replaced, after which the corrosion continued uniformly. It was thus observed that the surface of the lead buckles sometimes become coated with a film which inhibits or retards the action of the acid on the lead.

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To Study Rubber Accelerator's Action

Experiments made with mixtures of rubber, sulphur, zinc oxide and thiocarbanilide or hexamethylenetetramine have given interesting results, according to H. P. Stevens, writing in the *Bulletin of the Rubber Growers' Association*, vol. 5, pp. 292-6. The proportions were as follows: Rubber 100 parts, sulphur 6 parts, zinc oxide 10 parts, thiocarbanilide 3 parts or hexamethylenetetramine 1 part. Various samples of plantation rubber were used, vulcanization being carried out at 138 deg. C. In addition the customary rubber-sulphur mixture, containing 90 parts of rubber to 10 parts of sulphur, was used as a control.

The two accelerators produced a similar accelerating effect with the various rubbers and with one or two exceptions the variation in the rate of cure of the samples was reduced by thiocarbanilide and still further by hexamethylenetetramine. Rubber prepared by the dessication of sprayed latex was relatively accelerated less by hexamethylenetetramine than by thiocarbanilide. Ordinarily smoked rubber sheet and pale crêpe rubber, "matured rubber" in slab form and rubber coagulated with sodium silicofluoride were included among the samples tested.

Graded Temperature Zones in Coal Carbonization

Automatic Temperature Control Is Worth Attention Because of Its Use Here and Its Possibilities for Other Applications

BY C. H. S. TUPHOLME
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THE Freeman multiple retort for low-temperature carbonization of coal is designed in accordance with the principle that there is a range of critical and well-defined temperatures during carbonization. Accordingly the retort is divided into a series of zones, each of which is maintained at a definite temperature by means of an automatic temperature regulator. The raw fuel is passed from one stage to the next, being subjected in each to a different temperature and remaining for such a period of time as will insure the volatiles being driven off before passing to the next zone.

The present Freeman retort consists of six stages, the last being a cooling chamber for the discharge of the residual coke. The retort is of the vertical continuous type, 37 ft. in height and 5 ft. in diameter. The fuel, which has been pulverized to 10 mesh, is fed into a hopper at the top and from there continuously through a feeding valve, operated by an eccentric from the main drive, into the first zone. The fuel is kept in constant motion by means of scrapers fixed to a horizontal plate revolving about a central spindle.

On this first zone the coal is subjected to a temperature of 350 deg. F. for a period of 17 minutes. The occluded gases and the greater part of the moisture are driven off, being led away through a pipe. After the coal completes the circuit of the first zone, it falls through a chute into the second chamber.

The temperature in this second chamber is kept at 450 to 500 deg. F., the process being the same as in the first chamber—i.e., slow stirring for 17 minutes. The remainder of the moisture is yielded in this zone and metamorphosis of part of the coal substance into a partly soluble form takes place. Little gas and no oil are given off, and there is no apparent change in the coal constitution.

In the third stage the temperature is 600 deg. F. Here distillation of the low-temperature oils begins, while most of the gas is yielded. The designer states that in this zone is to be found the critical point which distinguishes low- from high-temperature carbonization, and that above this temperature level a change occurs, tar, pitch, anthracene, naphthalene and phenol being yielded, in addition to free oxygen, all of which are characteristics of the high-temperature process.

In the fourth zone the temperature is 650 deg. F., where more gas and oil is yielded, and in the fifth zone, at 750 deg. F., the last of the oil is driven off. The sixth zone is a chamber cooled by a current of cold air around the outside. The exit pipes from each of the zones is connected to a water-cooled condenser, the liquid being collected in a receiver, the gas passing to a holder. The residual coke, which is in a pulverized form, is discharged through an outlet at a temperature of anything between 100 and 400 deg. F.

It will be realized, of course, that the volatiles are collected separately from each chamber, and it is claimed that practically no cracking takes place, the resultant products being more valuable in consequence. The retort operation is continuous and automatic, the labor being minimized in consequence, and the period of carbonization being limited to 2 hours. If necessary, the speed of the retort can be accelerated according to the type of coal being carbonized.

An essential in this process is the Freeman precision temperature control by which the temperature at each stage of the distillation process is regulated. By the use of this device it is claimed that the temperature can be controlled within 1 deg. F. The battery of these regulators, one responsible for each of the six stages in the process, is located at any desired distance, from the distillation plant.

In this instrument *A* is the air lead tube to the source of heat. This tube ends in an air bulb placed inside the heated chamber. Any change in the temperature causes a contraction or expansion of the air inside the bulb. This bulb is connected to a short column of mercury in the glass tube *B*, placed at a slight angle to the horizontal. A change in volume in the bulb causes the mercury column to move in sympathy, the mercury making contact with the point *C*. The position of this point *C* can be adjusted by a fine screw thread *D*. In direct communication with the air lead *A* from the air bulb is a column of oil in the vessel *F*, in which a glass tube *E* dips below the surface, thus forming an oil seal. This also serves as an indication of the change of temperature in the distilling chambers. The mercury column *B* is mounted on a trunnion *G*, so that it may be turned at will; the smaller the angle to the horizontal the greater is the sensitiveness of the instrument.

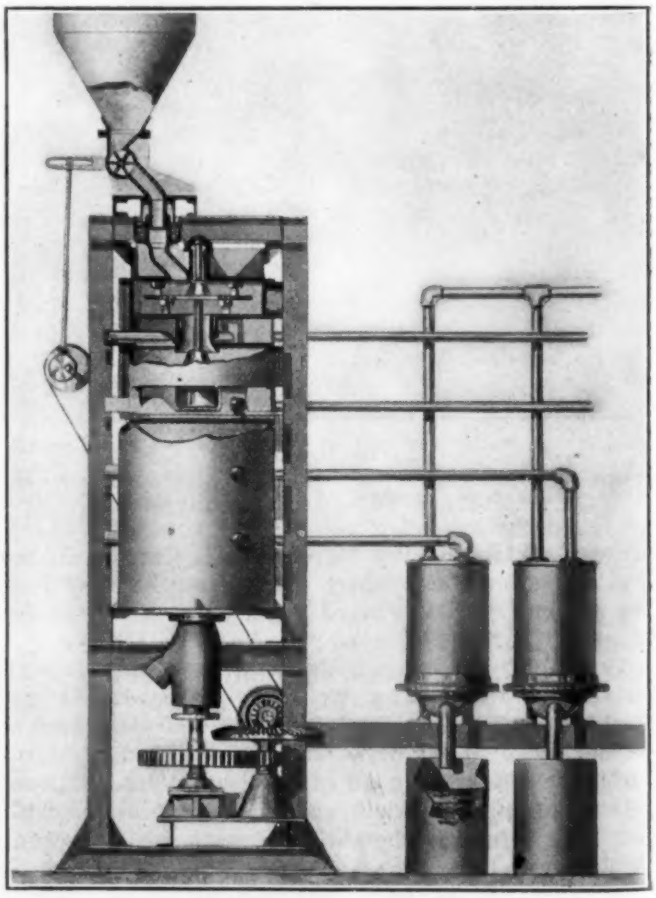

Fig. 1—Construction of Four-Stage Freeman Retort
The six-stage retort described in the text is of similar design.

A valve is fitted in the producer gas supply pipe to each chamber, which is operated either by a compressed air piston or a solenoid magnet, through a nitrogen tube switch *H*, actuated by an electro magnet *I*. This magnet is excited when the mercury column *B* makes contact with the point *C*. *L* is a double pole switch, *K* a socket for a resistance lamp and *J* a pilot lamp.

The average yield from an ordinary British mixed coking and non-coking coal is: 15 to 15.5 cwt. smokeless fuel, 1,200 cu.ft. gas of 750 B.t.u. per cu.ft., 25 gal. oil. There is no ammonia yield, the final temperature not being high enough to effect decomposition of the nitrogeneous organic matter.

The following results are typical of the Freeman retort:

	Raw Coal 1	Raw Coal 2
Moisture	1.69%	5.3%
Volatile matter	25.81%	24.95%
Fixed carbon	71.10%	54.90%
Ash	1.40%	14.85%
From the raw coal 1 was obtained:		
Smokeless fuel	1,782.9 lb., or 79.6%	
Gas	88.3 lb., or 3.94%	
Oil	263.9 lb., or 11.78%	
Water	95.4 lb., or 4.26%	
Loss	9.5 lb., or 0.42%	
From raw coal 2 was obtained:		
Smokeless fuel	1,692.3 lb.	
Gas	1,133.2 cu.ft. of 670 B.t.u. per cu.ft.	
Oil	257.9 lb., or 25½ gal.	
Water	221.7 lb.	
The residual fuel in each case analyzed:		
	From Coal 1	From Coal 2
Volatile matter	8.35%	10.39%
Fixed carbon	89.86%	73.26%
Ash	1.79%	16.35%

The residual fuel, which is in the form of a pulverulent coke, contains on an average from 8 to 10 per cent volatile matter. When used as a domestic fuel, the coke is briquetted, very little binder being required. If it is intended for industrial purposes, it is pulverize to a fine state and fired as a powdered fuel. This coke may also be totally gasified for lighting or power gas. Freeman claims that, while coal with low ash and high volatile content will give, in the ordinary high-temperature process, 20,000 cu.ft. of gas and 10 gal. of tar per ton, in his report followed by total gasification by the Freeman method the same coal will yield 65,000 cu.ft. of gas and 30 gal. of a high-grade oil.

The gas yield from the Freeman retort is not large, but it is of high quality, being particularly rich in methane and ethylene combinations.

The oil yield is large and valuable owing to the absence of cracking. From an average Freeman oil, fractionation will give about 5 gal. of motor spirit. The crude oil is available without further treatment for fuel oil. There is an absence of phenols, creosols, anthracenes and naphthalenes. About 8 gal. of lubricating bases can be separated, the residues containing no pitch or free carbon.

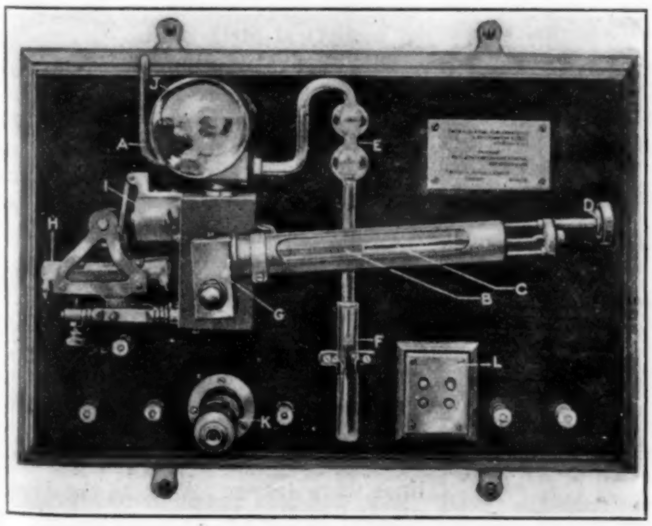

Fig. 2—Freeman Precision Temperature Control

The oil from coal 1 on coming from the condenser is brown in color, yields 28.2 gal. to the ton of this coal and has a specific gravity of 0.976. Fractionation of this oil gave 2.8 gal. between 0.719 and 0.774 sp.gr., 3.8 gal. of 0.934 sp.gr., 0.5 gal. water and 6.9 gal. pitch.

One advantage claimed for the Freeman process is its flexibility. Treatment can be varied according to the nature of the raw fuel. It has been found that, as a general rule, it does not pay to treat specially for oil yield if the volatile centent is under 20 per cent. If the oil yield is likely to be low it is left in the coal for briquetting or to enrich the gas if the total gasification is undertaken.

Petroleum Evaporation Losses Demand Attention

Evaporation losses of petroleum stored on the producing property, which run into enormous figures, can be effectively reduced by the use of gas-tight storage tanks, states the Department of the Interior as the result of experimental work performed by the Bureau of Mines. It is stated that under present average conditions in the mid-continent field approximately 6.5 per cent of the oil produced is lost by evaporation, 3.5 per cent occurring on the lease and 3 per cent in transportation. A loss from well to refinery as high as 9.3 per cent in less than 10 days has been observed. Counting the time that oil is held on the lease, in the pipe line, in storage-tank farms and in refinery storage, the average time elapsed between the well and the stills at the refinery is nearly 5.1 months. For some methods of handling oil the "well to refinery" evaporation loss will be 12 or 15 per cent of the crude produced at the well.

The Bureau of Mines estimates that the amount of oil saved from evaporation by making lease tanks gas tight will pay for the installation of the necessary equipment in from 30 to 90 days, with crude oil selling at $2 per barrel. Widespread adoption of evaporation-proof tanks has been delayed by the failure of production managers to realize, first, that their evaporation losses are enormous, and second, that these losses can be practically eliminated at a relatively small cost.

The handling of crude oil from well to pipe line in the future will, it is believed, involve the installation of the following equipment: (1) Gas traps for separating the permanent gas from the oil at pressure above atmospheric, (2) really tight flow or separating tanks, and (3) tight stock tanks. If this procedure is followed, methods for reducing pipe-line losses must be devised.

Technical Paper 319, by J. H. Wiggins, just issued, describes in detail certain up-to-date practices that tend to decrease evaporation losses in the handling of crude oil. The subjects discussed include evaporation of gasoline and its recovery by a gasoline plant, a demonstration of the difference in loss from tanks differing in airtightness; the economic value of replacing old-type roofs by tight ones; the effect of passing fresh oil through a high-vacuum tank; and tests to determine pipe-line losses. A brief discussion of the improved practice to be expected in handling crude oil concludes the report.

Determining Discharge Coefficients for

Flow of Water in Short Pipes

A Short Method for Determining Loss of Head for Water Flowing in Pipes Which May Be Readily Applied in Other Cases of Fluid Flow

By Prof. Orlan W. Boston
University of Michigan

It is believed that the method employed by the writer in certain experiments conducted at the University of Michigan could be used to advantage if more commonly known, because of its simplicity, brevity and ready adaptability to many problems of this character. Once a set-up is completed, many tests of a comparative nature may be run in a short time.

In order to determine accurately the discharge of any pipe, the conditions of discharge must be known. These conditions are so varied and complicated that theoretical formulas give only approximate results. Accurate results may be had for every particular case, however, if the several quantities involved are modied by coefficients or exponents that have been determined for specific cases by experimental work.

In the case of a straight pipe flowing full and discharging under a constant head into the atmosphere, the only losses in head to be considered are the head loss at the entrance, the head loss due to friction between the pipe and the moving water, and the head loss due to the internal friction of the water. It was intended through these experiments to determine for pipes ranging in even inches from 1 in. to 8 in. in internal diameter, inclusive, coefficients to represent:

1. Entrance loss.
2. Friction loss per foot.
3. Friction loss due to bends of various radii.
4. Sudden-enlargement loss.
5. Sudden-contraction loss.
6. Friction loss of various types of valves.

With the apparatus selected, these coefficients could be obtained for all heads between 0 and 6.8 ft. (i.e., for velocities between 0 and 21 ft. per second).

A set of discharge constants for all heads within the limits was obtained for each pipe diameter in one test by allowing a filled tank to empty itself, the water flowing out through the orifice tube or pipe as in Fig. 1, which shows a vertical section of the tank and short pipe. For simplicity the notation used is as follows:

> **FLOW OF FLUIDS**
>
> **In problems dealing with the flow of fluids, the chemical engineer is often confronted with circumstances in which he desires to make a number of determinations of the frictional resistance of short pipes for comparative purposes. The method presented in this paper suggests a means by which this may be done with great saving in time over methods that are usually employed.**
>
> **A UNIT PROCESS ARTICLE**

H = head of water above center of outlet, ft.

A = cross-sectional area of tank at H, sq.ft.

dH = drop in head in a small increment of time (dT seconds), ft.

dT = time for the head to be lowered the distance dH, sec.

a = cross-sectional area of pipe (or outlet), sq.ft.

C = coefficent of discharge, which is the relation between actual and theoretical discharge.

g = acceleration due to gravity fed per sec. per sec.

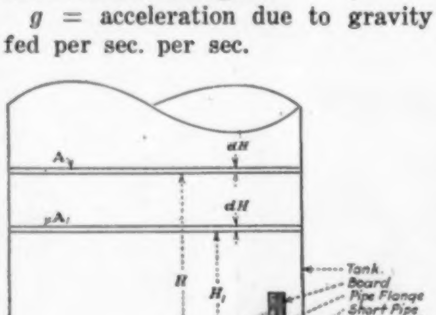

Fig. 1—Tank and Short Pipe as Arranged in Tests

v = average velocity in tube (ft. per sec.) for the head H, which equals the theoretical velocity modified by the constant C, or $v = C\sqrt{2gH}$ also $v_1 = C_1\sqrt{2gH_1}$ etc.

Then $\frac{dH}{dT} A$ = discharge Q at head H in cu.ft. per second

also $\frac{dH_1}{dT_1} A_1$ = discharge Q, at head H in cu.ft. per second.

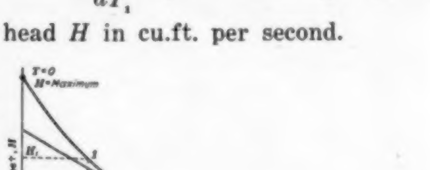

Fig. 2—Head-Time Curve of Flow Through Pipe

The discharge through the short pipe for head H must also equal $Q = av = aC\sqrt{2gH}$; also $Q_1 = aC_1\sqrt{2gh_1}$ at head H_1. Therefore,

$$\frac{dH}{dT} A = aC\sqrt{2gH} \text{ and } \frac{dH_1}{dT_1} A_1 = aC_1\sqrt{2gH_1}.$$

When the flow through the opening is started, the time equals zero and the head is a maximum. As the time is increased the head is reduced and follows a curve similar to that shown in Fig. 2. Also T_1 is the time required for the head to be reduced to H_1, T_2 the time for it to be reduced to H_2, etc. It is, therefore, necessary only to measure experimentally this relation between the head and time to determine a coefficient of discharge for any opening. The value of dH/dT at any head H is the value of the tangent to the H-T curve at that point, and may be determined as shown in Fig. 2 or by analytical methods.

The apparatus used consisted of a cylindrical cypress tank 8 ft. deep and 8 ft. in diameter, a head-time recording instrument, and a set of short pipes. After the tank was well soaked its cross-sectional area for each tenth of a foot above the center of the tube was determined.

The head-time recording instrument consisted of a motor-driven drum 8 in. in diameter and 20 in. long. On the drum was mounted the data sheet. Two pens rested on the data sheet in such a way that, as the drum was rotated, two parallel lines were drawn. Also, as the drum rotated the pens were moved along its axis so that the parallel lines

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were really helices on the drum. One of the pens was attached by an electric circuit to a seconds clock so that each half second was indicated. The other was attached to a float on the surface of the water. The float was attached to a fine wire wound on a small drum. As the float was lowered, the drum rotated and closed the electric circuit for each tenth of a foot that the float was lowered. These two pens produced parallel lines with steps as shown in Fig. 3. In this figure $dT = \Delta T$, or the time for the surface of the water to be lowered $dH = \Delta H$ or 0.1 ft.

In running an experiment the point on the head line for initial or maximum head was noted and the time designated as zero. From this point on, the head was reduced 0.1 ft. for each contact; the lapsed time for each 0.1-ft. change in head was

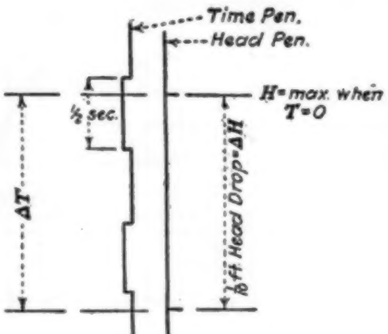


Fig. 3—Chart From Head-Time Recording Instrument

calculated and the individual times then accumulated. These values plotted give the head-time curve of Fig. 2.

The short tubes or pipes were approximately 1, 2, 3, 4, 5, 6, 7, and 8 in. in internal diameter, respectively, and their length was made three times their diameter. According to an experiment by Professor Pardoe of the University of Pennsylvania, published in *Engineering News*, Sept. 14, 1916, the length at which a 2-in. tube flows full varies with the head. The 2-in. tube of his experiment flowed full at a length of approximately 6 in., or three times the diameter, under a head of 8 ft. The experiment also showed that this length decreased as the head was lowered.

In general, water will enter a short pipe under the same conditions as it discharges through an orifice. Just inside the pipe the area of the stream is contracted so that the pipe does not flow full. Farther along the pipe this area is increased to that of the pipe and it then flows full. (See Fig. 1.) A partial vacuum exists at the point of this contracted flow, which increases the discharge as compared with that of an orifice. The discharge coefficient is increased from about 0.6 for a circular sharp-edged orifice to about 0.8 for the short tube.

As shown in Fig. 1 the short pipe was screwed into a standard flange so that the end of the pipe was flush with the face of the flange. The face and internal diameter of the pipe were finished to present a knife-edged entrance into the pipe. Each flange was recessed in a board which had been boiled in paraffine so that the surfaces of flange and board were flush. The boards were used to present a plane surface of from 3 or 4 pipe diameters wide on all sides of the entrance to eliminate eddies as far as possible and to standardize conditions.

The board, with the pipe and flange in place, was screwed to the inside of the tank, near the bottom, the pipe extending horizontally through the tank wall. The opening between pipe and wall was packed to prevent leakage. While the tank was being filled, a piece of leather belting was held in position over the orifice by water pressure. The tank was filled to a specific height above the center of the orifice and allowed to stand many hours to permit the water to come to rest. A wire attached to the leather served to move it when the test was started without causing excessive motion of the

Table I—Coefficients of Discharge for Short Pipe 1 In. in Diameter

$$C = \frac{\frac{dH}{dt}}{a\sqrt{2gH}}$$

Diameter of pipe, 1.029 in.
Length of pipe, 3.000 in.
Area (a) of pipe, 0.005775 sq. ft.
Temperature of water, 58 deg. F.
Gravity, 32.16 ft. per sec. per sec.

H	A	A_a	ΔT	Δt	$\Delta\Sigma t$	$\frac{dH}{dt}$	C
6.8	39.34	......	......	......	......	0.0957	0.792
6.7	39.4	39.37	48.6	1.235	1.235	0.0949	0.792
6.6	39.46	39.43	49.2	1.234	2.478	0.09415	0.791
6.5	39.52	39.49	38.2	0.968	3.446	0.0933	0.791
6.4	39.585	39.552	46.2	1.169	4.615	0.0927	0.791
6.3	39.647	39.61	41.4	1.046	5.661	0.0920	0.791
6.2	39.71	39.673	40.8	1.030	6.691	0.0911	0.791
6.1	39.77	39.74	44.1	1.111	7.802	0.0904	0.791
6.0	39.835	39.802	46.2	1.160	8.962	0.0897	0.791
5.9	39.90	39.87	45.0	1.129	10.091	0.0888	0.791
5.8	39.96	39.93	44.4	1.112	11.203	0.0880	0.791
5.7	40.02	39.99	44.4	1.111	12.314	0.0873	0.791
5.6	40.10	40.06	48.0	1.200	13.514	0.0866	0.791
5.5	40.17	40.135	45.85	1.144	14.658	0.0859	0.791
5.4	40.245	40.21	47.1	1.173	15.831	0.08515	0.791
5.3	40.32	40.29	45.8	1.138	16.969	0.0843	0.791
5.2	40.39	40.36	50.3	1.247	18.216	0.0835	0.791
5.1	40.464	40.425	46.8	1.160	19.376	0.0827	0.791
5.0	40.54	40.50	50.4	1.245	20.621	0.0819	0.791
4.9	40.61	40.575	48.6	1.199	21.820	0.081	0.791
4.8	40.68	40.645	51.5	1.268	23.088	0.0802	0.791
4.7	40.76	40.72	48.0	1.180	24.268	0.0793	0.791
4.6	40.83	40.795	53.4	1.308	25.576	0.0785	0.791
4.5	40.90	40.865	52.75	1.290	26.866	0.0777	0.791
4.4	40.98	40.94	54.0	1.320	28.186	0.0767	0.791
4.3	41.05	41.015	51.6	1.260	29.446	0.0758	0.791
4.2	41.13	41.09	55.65	1.356	30.802	0.075	0.791
4.1	41.20	41.165	55.2	1.375	32.177	0.07441	0.791
4.0	41.28	41.24	56.25	1.364	33.541	0.0732	0.791
3.9	41.35	41.32	54.6	1.322	34.863	0.0723	0.791
3.8	41.42	41.385	57.0	1.379	36.242	0.0714	0.791
3.7	41.50	41.46	59.4	1.434	37.676	0.0704	0.791
3.6	41.58	41.54	61.7	1.485	39.161	0.0695	0.791
3.5	41.66	41.62	58.2	1.400	40.561	0.0685	0.791
3.4	41.74	41.70	59.4	1.426	41.987	0.0696	0.791
3.3	41.82	41.78	63.0	1.508	43.495	0.0666	0.791
3.2	41.90	41.86	69.6	1.660	45.155	0.0656	0.791
3.1	41.98	41.94	60.0	1.431	46.596	0.0646	0.791
3.0	42.06	42.02	65	1.547	48.133	0.0634	0.790
2.9	42.14	42.10	66	1.570	49.703	0.0625	0.790
2.8	42.22	42.18	72	1.710	51.423	0.0614	0.790
2.7	42.30	42.26	68.4	1.620	53.032	0.0603	0.790
2.6	42.39	42.345	66.6	1.573	54.606	0.0592	0.790
2.5	42.48	42.435	71.7	1.690	56.296	0.0581	0.790
2.4	42.57	42.525	75.6	1.780	58.076	0.0568	0.790
2.3	42.66	42.615	73.8	1.733	59.809	0.0556	0.790
2.2	42.75	42.705	76.8	1.800	61.609	0.0545	0.790
2.1	42.84	42.795	80.4	1.879	63.488	0.0532	0.790
2.0	42.93	42.895	79.85	1.863	65.351	0.0518	0.790
1.9	43.02	42.975	84	1.955	67.306	0.0505	0.790
1.8	43.10	43.06	88.75	2.061	69.368	0.0491	0.790
1.7	43.20	43.15	89.3	2.072	71.439	0.0478	0.790
1.6	43.29	43.245	90.25	2.090	73.520	0.0462	0.790
1.5	43.38	43.335	93	2.150	75.679	0.0448	0.790
1.4	43.47	43.425	99.3	2.290	77.969	0.0432	0.789
1.3	43.56	43.515	98.1	2.255	80.224	0.0417	0.788
1.2	43.65	43.605	110	2.528	82.752	0.0400	0.788
1.1	43.74	43.695	109.2	2.500	85.252	0.0382	0.788
1.0	43.83	43.785	119.3	2.723	87.975	0.0365	0.788
0.9	43.92	43.815	126.6	2.884	90.859	0.0346	0.787
0.8	44.01	43.965	126.8	2.883	93.742	0.0326	0.787
0.7	44.10	44.055	134.7	3.060	96.802	0.0304	0.787
0.6	44.20	44.15	153	3.470	100.272	0.0282	0.786
0.5	44.18	44.19	172.8	3.910	104.182	0.0257	0.785
0.4	44.28	44.23	196.2	4.440	108.622	0.0229	0.784
0.3	44.38	44.33	186.6	4.215	112.837	0.0198	0.782
0.2	44.48	44.43	241.2	5.430	118.267	0.0161	0.778

Table II—Method Used in Computing dH/dt for the 1-In. Short Pipe

H	$\Sigma\Delta t$	ΔH	Δt	$\frac{\Delta H}{\Delta t}$
6.8	0	...	....	....
6.5	3.446	0.3	3.446	0.087057
6.0	8.962	0.5	5.516	0.090645
5.5	14.658	0.5	5.696	0.087781
5.0	20.621	0.5	5.963	0.083850
4.5	26.866	0.5	6.245	0.080064
4.0	33.541	0.5	6.675	0.074906
3.5	40.561	0.5	7.020	0.071225
3.0	48.133	0.5	7.572	0.066033
2.5	56.296	0.5	8.163	0.061252
2.0	65.351	0.5	9.055	0.055218
1.5	75.679	0.5	10.328	0.048412
1.0	87.975	0.5	12.296	0.040664
0.5	104.182	0.5	16.207	0.030851
0.2	118.267	0.3	14.085	0.021299

water in the tank. This method allowed the water, during discharge, to settle slowly in the tank with very little disturbance, and because of the large ratio between the orifice and tank areas, the results were but little affected by the velocity of approach.

The 1-in short pipe was used in the initial set-up. The first time the water was emptied through it the pipe did not flow full, but acted as an orifice, the stream of water having the appearance of a solid glass rod. The discharge was then stopped by plugging the tube on the discharge end and subsequently released. This caused the pipe to flow full at the discharge end as shown by the data. The fact that the 6-in. and 7-in. short pipes discharged as pipes at times and then as orifices, while the 8-in. pipe discharged only as an orifice, indicates that as the diameter of the pipe is increased, the ratio between length and diameter should also be increased. This, however, is in itself a subject for research. It is believed that the friction derived from the error in using a ratio of 3 to 1 between length and diameter instead of the theoretically correct ratio has not appreciably affected the results obtained. The 8-in. pipe when discharging as an orifice gave results that check very well the values given by other experimenters.

The method used in computing coefficients of discharge from the time-head data obtained in the tests is shown in Table I for the 1-in. short pipe, where

H = head, ft.

A = actual cross-sectional area of tank at H, sq.ft.

A_a = average cross-sectional area of tank at H as the water is lowered 0.1 foot, in square feet.

ΔT = time in seconds for water to be lowered 0.1 ft. at H and through area A_a.

Δt = time in seconds for water to be lowered 0.1 ft. at H, based on 1 sq.ft. cross-sectional area of tank $= \frac{\Delta T}{A_a}$.

$\Sigma\Delta t$ = accumulated sum of Δt at H.

$\frac{dH}{dt}$ = tangent of H-$\Sigma\Delta t$ curve at H.

C = coefficient of discharge of pipe at H.

The coefficients given for all pipes are based on values of dH/dt as determined mathematically. Table II indicates the necessary steps. Values of the head are taken at random, in this case every half-foot when convenient. The total lapsed time $\Sigma\Delta t$ at that head is placed in the second column. The third and fourth columns contain the increments of the head, ΔH, and the time, Δt, respectively. The next column lists

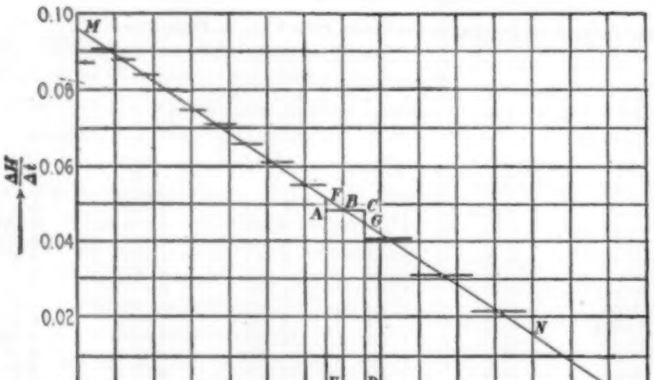


Fig. 4—Curve of Relation Between $\frac{\Delta H}{\Delta T}$ and $\Sigma\Delta t$

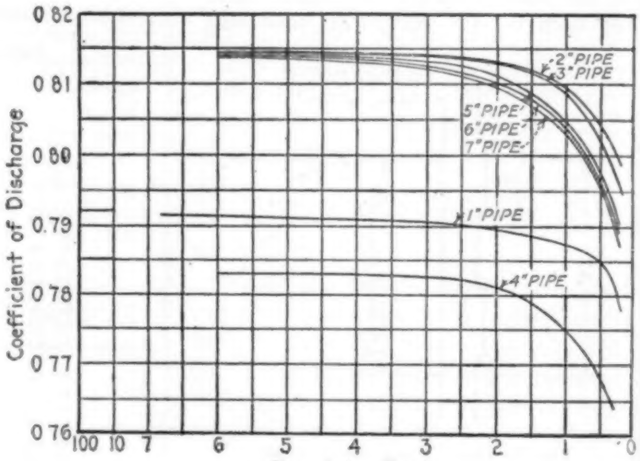


Fig. 5—Curves of Discharge Coefficients of Short Pipes

Table III—Values of Discharge Coefficients for Short Pipes Ranging in Diameter From 1 In. to 7 In., Inclusive

(Note: The 8-in. pipe functioned as an orifice.)

Head in Feet	Diameter of Pipe in Inches (Length = 3 × Diameter)							
H	1.029	2.0459	3.2236	4.0556	5.0624	6.0576	6.98	7.955
100	0.792	0.815	0.815	0.785	0.815	0.815	0.815	0.601
10	0.792	0.814	0.814	0.785	0.814	0.814	0.814	0.598
6.8	0.792	.....	.....	.....	.....	.....	.....	.....
6.6	0.791	.....	.....	.....	.....	.....	.....	.....
6.4	0.791	.....	.....	.....	.....	.....	.....	.....
6.2	0.791	.....	.....	.....	.....	.....	.....	.....
6.0	0.791	0.814	0.814	0.783	0.814	0.814	0.814	0.598
5.8	0.791	0.814	0.814	0.783	0.814	0.814	0.814	0.598
5.6	0.791	0.814	0.814	0.783	0.814	0.814	0.814	0.598
5.4	0.791	0.814	0.814	0.783	0.814	0.814	0.814	0.598
5.2	0.791	0.814	0.814	0.783	0.814	0.814	0.813	0.598
5.0	0.791	0.814	0.814	0.783	0.814	0.814	0.813	0.598
4.8	0.791	0.814	0.814	0.814	0.783	0.814	0.813	0.598
4.6	0.791	0.814	0.814	0.783	0.814	0.814	0.813	0.598
4.4	0.791	0.814	0.814	0.783	0.814	0.814	0.813	0.598
4.2	0.791	0.814	0.814	0.783	0.814	0.813	0.813	0.598
4.0	0.791	0.814	0.814	0.783	0.814	0.813	0.813	0.598
3.8	0.791	0.814	0.814	0.783	0.814	0.813	0.813	0.598
3.6	0.791	0.814	0.814	0.783	0.814	0.813	0.813	0.598
3.4	0.791	0.814	0.814	0.783	0.814	0.813	0.813	0.598
3.2	0.791	0.814	0.814	0.783	0.813	0.813	0.812	0.597
3.0	0.790	0.814	0.814	0.783	0.813	0.813	0.812	0.597
2.8	0.790	0.814	0.814	0.782	0.813	0.812	0.812	0.597
2.6	0.790	0.814	0.814	0.782	0.813	0.812	0.811	0.596
2.4	0.790	0.814	0.813	0.782	0.812	0.812	0.811	0.596
2.2	0.790	0.813	0.813	0.782	0.812	0.811	0.810	0.595
2.0	0.789	0.813	0.813	0.781	0.811	0.810	0.810	0.595
1.8	0.789	0.813	0.813	0.780	0.810	0.809	0.809	0.594
1.6	0.789	0.812	0.812	0.780	0.809	0.808	0.808	0.594
1.4	0.789	0.812	0.811	0.778	0.808	0.807	0.806	0.593
1.2	0.788	0.811	0.810	0.777	0.807	0.806	0.805	0.592
1.0	0.788	0.810	0.809	0.775	0.805	0.804	0.803	0.590
0.8	0.787	0.808	0.807	0.773	0.803	0.802	0.801	0.587
0.6	0.786	0.806	0.804	0.770	0.800	0.798	0.798	0.582
0.4	0.784	0.803	0.800	0.766	0.796	0.794	0.793	.....
0.2	0.778	0.800	0.796	.....	.....	.....	.....	.....

$\Delta H/\Delta t$, which is the average slope between the points. These values are then plotted as ordinates with $\Sigma\Delta t$ as abscissas, as shown in Fig. 4. As the line AC represents the average slope of the H-$\Sigma\Delta t$ curve between points E and D, then some line FG will represent the actual slope at all points of the H-$\Sigma\Delta t$ curve within these limits, as the area $ACDE$ must equal the area $FGDE$. In other words, area AFB must equal area BCG. Also the area of all such rectangles as $ACDE$ must equal the area under the line MN. In this way the line MN is located and its equation found to be

$$\frac{dH}{dt} = 0.00672t - 0.0957 \ldots. (1)$$

Let $t = \Sigma\Delta t$. Integrating this curve and making it pass through some point on the H-$\Sigma\Delta t$ curve, gives

$$H = 0.00336t^2 - 0.0957t + 6.822 \quad (2)$$

Solving with equation (1)

$$\frac{dH}{dt} = 0.001344H - 0.0000103 \quad (3)$$

which gives a relation between the tangent dH/dt and the head H, from which the values of dH/dt in Table I were computed.

Table III gives the coefficients of discharge for all of the short pipes. The values for the 8-in. pipe are those of an orifice, indicating that the pipe did not flow full. These values are plotted in Fig. 5. The values of the 1-in. and 4-in. pipes are consistently lower than those of the other sizes, for which no explanation can be given. The curves are similar, which indicates a constant error such as might occur in the measurement of the pipe area. It is interesting to note that the coefficients do not decrease when the head is greater than 3 ft. to 5 ft. as is the case with coefficients of discharge of orifices. Fig 5 shows the values based on formulas for heads of 10 ft. and 100 ft.

Velocity of Flow by the Salt Method

Some Tests Conducted on the Method of Determining the Velocity of Water Flowing in Pipes by Salt Solution and Its Electrical Resistance

By Eric Crewdson

Abstracted from *The Engineer*, London, Dec. 14, 1923

> ### FLOW OF FLUIDS
>
> **Flow of fluids is one of the most important processes with which the chemical engineer must deal. Often it is necessary in the course of routine operation to obtain regular records of the amount of fluid flowing through a pipe line. The method used by the author of this paper in the tests described for the determination of the flow of water in pipes suggest methods of fluid flow measurement that should be adaptable to useful application in many similar cases.**
>
> ### A UNIT PROCESS OF CHEMICAL ENGINEERING

THE accurate measurement of flowing water is a matter of considerable difficulty. There are several methods at present in use for determining the rate of fluid flow:

1. By observing the flow over a weir or notch.
2. By gaging the water in a venturi meter.
3. By observing the velocity of flow with either a currrent meter or a pitot tube.
4. By chemical methods.

Each of these methods has its disadvantages, such as expense or uncertainty in use. Another system suggested often is the so-called "color method." This method was used by M. Ribourt in tests at Brides-les-Bains in September, 1903. ("La Mesure du Débit dans les Essais de Turbines Hydrauliques," by E. F. Côte and H. Bellet. Jules Rev. Grenoble, 1909.) In this case a small amount of color solution was introduced at the upper end of the pipe line and the time of passage of the maximum concentration of the color at the lower end was observed, the time interval between the introduction of the dye and the maximum concentration of the color at the lower point being taken to be the mean time of passage of a volume of water equivalent to the volume in the pipe.

M. Ribourt's general conclusion seems to have been that this method overestimates the velocity of mean flow, and that a co-efficient of something between 0.90 and 0.95 should be applied in working out the results to obtain the rate of flow accurately. This method is also suggested by P. A. M. Parker. ("The Control of Water," by P. A. M. Parker. Routledge, 1913.) He claims a considerable degree of accuracy for it and certainly more than would be indicated by M. Ribourt's experiments or others that I have made on several occasions.

A modification of this method, which was suggested and is now being studied by Professor Allen, of Worcester Polytechnic Institute, introduced common salt in place of color. The time of arrival of the salt solution at the lower end of the pipe is indicated by the reduction in electrical resistance between two electrodes fixed in the pipe in contact with the water. The lime is measured from the introduction of the salt to the time of minimum resistance between the electrodes.

The tests made by the writer with this method were not entirely satisfactory, because of the difficulty of insuring immediate mixing of the salt with the water. A modification was to introduce the salt at head of pipe line and use two sets of electrodes near the lower end of the pipe. This insured a thorough mixture of the salt and water by the time the water reached the first set of electrodes.

A set of tests with this method was made on a water turbine installation by Gilbert Gilkes & Co., Ltd., for Captain W. Best, at Vivod, Llangollen, North Wales, who kindly gave every assistance in carrying out the tests. Here there is a cast-iron pipe line having a total length of about 800 yd., part of which is 12-in. bore and part 9-in. bore. The pipe line is supplied from a reservoir built in brick and having a superficial area at overflow level of about 2,540 sq.ft. The pipe line supplies two impulse wheels at its lower end, one being a 12-in. diameter Turgo impulse wheel and the other a 15-in. Pelton wheel. A rectangular weir without end contractions was fixed in the tailrace from the wheels. The flow of water into the reservoir was completely shut off; it was thus possible by means of the weir and by simultaneous observations of the drop in level of the reservoir to check very closely the measurement of flow obtained by the salt method.

The 12-in. portion of the pipe is at its upper end and the lower portion

Observations Taken at Vivod, Llangollen, Sept. 14, 1923, for G. Gilkes & Co., Ltd., Kendal.

No. of Test	Time of Day	Time Interval *B* on Diagram Min., Sec.		Time Interval *A* on Diagram Min., Sec.		Time Interval *C* on Diagram Min., Sec.		Time Interval Calculated From *A*, *B*, and *C* Seconds	Quantity of Water, Cu.Ft. Per Minute: Weir Readings	Drop of Reservoir Reading	Salt Method
1	12.58	4	44	1	2	2	21	323.5	27.2	27.97	26.3
4	3.45	3	7	1	43½	1	8½	169.5	50.5	48.44	50.1
5	3.54	2	57¾	1	14	1	7½	174.5	50.5		48.7
6	4.10	2	11¾	0	42	0	39½	131.5	66.6		64.7
7	4.14	2	12½	0	55½	0	51¼	130.4	66.6	65.5	65.2
8	4.19	2	12	0	57	0	55	131.0	66.8		64.9
9	4.35	1	31	0	29	0	28	90.5	97.0		94.0
10	4.40	1	31	0	30	0	29	90.5	97.0	96.95	94.0
11	4.43	1	31½	0	35½	0	33½	90.5	97.0		94.0
12	4.57	1	14¼	0	20	0	19	73.75	119.2	114.75	115.2
13	5.3	1	14	0	29	0	29	74.0	119.2		114.9

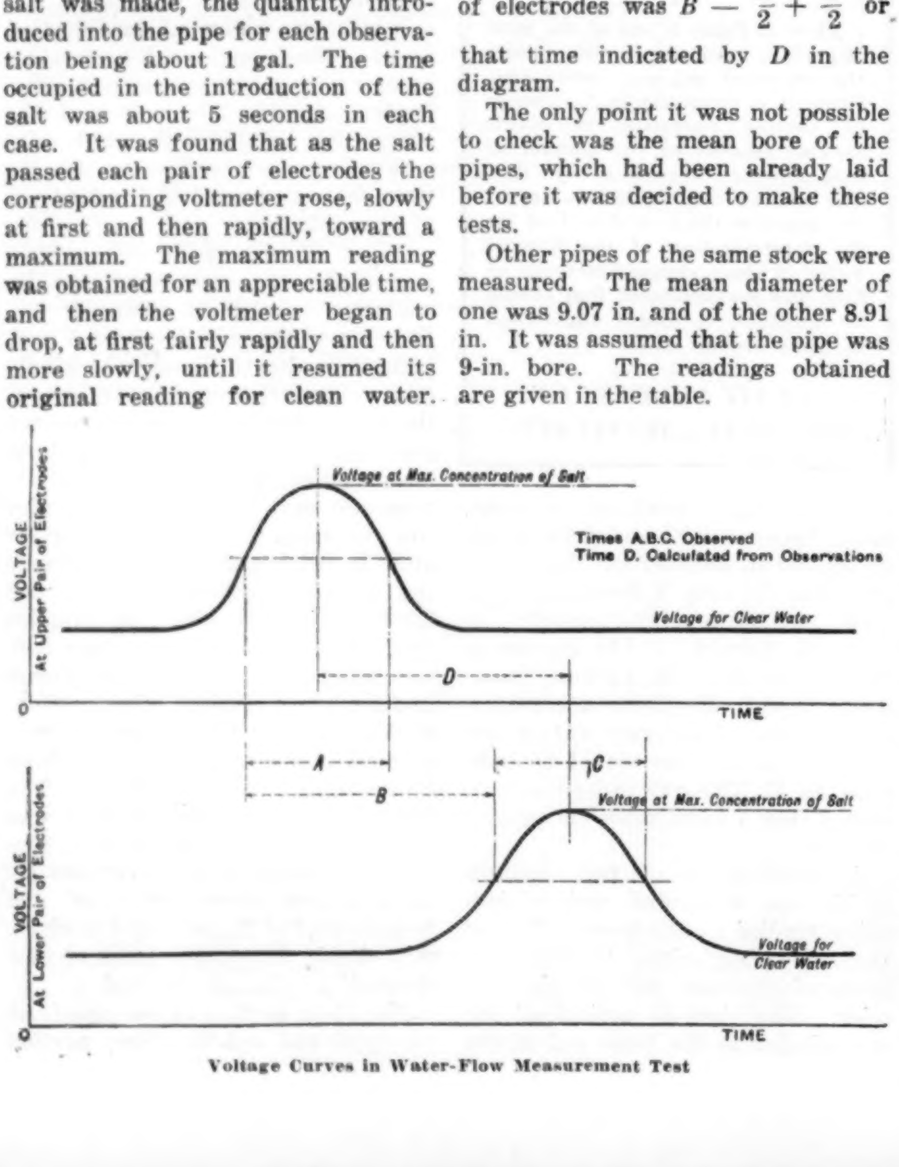
is 9-in. bore, all the lower length where the observations were taken being new. The salt was introduced about 20 yd. from the reservoir outlet; the lower pair of electrodes was screwed into the pipe just after it had entered the power house and before it reached the wheels, the upper pair being similarly fixed 321 ft. above. Direct current at 110 volts was available and leads were connected to each pair of electrodes through voltmeters. The electrodes used were ordinary sparking plugs, slightly modified.

A saturated solution of common salt was made, the quantity introduced into the pipe for each observation being about 1 gal. The time occupied in the introduction of the salt was about 5 seconds in each case. It was found that as the salt passed each pair of electrodes the corresponding voltmeter rose, slowly at first and then rapidly, toward a maximum. The maximum reading was obtained for an appreciable time, and then the voltmeter began to drop, at first fairly rapidly and then more slowly, until it resumed its original reading for clean water. The rise of voltage indicated on the voltmeter was of the order of 30 volts, but depended to some extent on the velocity of flow.

If recording voltmeters had been available, the type of diagram obtained would have been as illustrated in the cut herewith. The thick line on the upper diagram refers to the upper pair of electrodes, and that on the lower diagram to the lower pair of electrodes. The times measured were *A*, *B* and *C*, and it was assumed that the mean time of passage of the salt between the two pairs of electrodes was $B - \frac{A}{2} + \frac{C}{2}$ or that time indicated by *D* in the diagram.

The only point it was not possible to check was the mean bore of the pipes, which had been already laid before it was decided to make these tests.

Other pipes of the same stock were measured. The mean diameter of one was 9.07 in. and of the other 8.91 in. It was assumed that the pipe was 9-in. bore. The readings obtained are given in the table.



Voltage Curves in Water-Flow Measurement Test

It will be observed that the salt method readings are of the same order of accuracy as the weir readings, assuming that the reservoir readings are correct. It, therefore, appears that the salt method, if carefully carried out, is quite as accurate as any of the methods usually available for the measurement of the flow of fluids in pipes, and it seems a cheap and simple method to employ where such figures are required.

Steel Must Be Clean to Resist Fatigue

Some recent work by Dr. H. W. Gillett at the Ithaca field office of the Bureau of Mines on the endurance of steels against fatigue lays new emphasis on the evil effect of non-metallic inclusions. Dirty steel gave far less uniform results on endurance tests than clean steel, and dirty steel showed itself to be particularly unreliable and unsafe where sustained vibration occurred.

Non-metallic inclusions, or other similar inhomogeneities in the metal, are probably the cause of many failures in service. The Bureau of Mines tests corroborated the statement that the endurance properties of any really clean steel may be quite safely predicted. But when the steel is not clean, it may give either the same results as a clean steel or far poorer results, depending on whether the most severely stressed spot in a piece made from the dirty steel happens to be locally clean or not.

The problem of the exact effect of different inclusions or inhomogeneities in steel and other alloys, and the larger problem of how to produce clean steel and alloys, are of vital importance and involve many factors in the preparation of metallic products, ranging from the methods of elimination of impurities from the ores down through the smelting of the metals and melting of alloys.

To obtain further information on the effect of inclusions, comparisons are being made of endurance tests on specimens cut both with and across the direction of rolling, since the latter, or transverse specimens, usually show the bad effect of inclusions and inhomogeneities most markedly. As soon as the endurance tests on the series of molybdenum, cerium and comparison steels are completed, tests will be made on a series of nickel-silicon steels previously made by the Bureau of Mines for the navy, on which tests made by the navy on properties other than endurance are available.

Equipment News

From Maker and User

Automatic Control for Water-Gas Sets

Description of a Device That Should Prove of Interest to Operators of Continuous Process Industries

The water-gas manufacturing industry is a good example of that type of continuous industry wherein automatic control can be advantageously used. In such an industry, by the use of some automatic controlling device or method, predetermined conditions can be maintained with a degree of precision and regularity that could never be reached by a human operator. And safety—protection against shutdown and accident—is much more nearly assured.

As an example of such a device, the new Kennedy Automatic Control, made by Bartlett Hayward Co., Baltimore, Md., and recently tried out in several gas works in New York City, will prove interesting. The control for each water-gas set consists of three parts: The timer, which automatically times the opening and closing of the several valves of the set in proper sequence for the blow and run; the controller, which raises and lowers the levers in the hydraulic control nest; and the electric wiring between the timer, the controller and the interlock switches attached to the valves of the set.

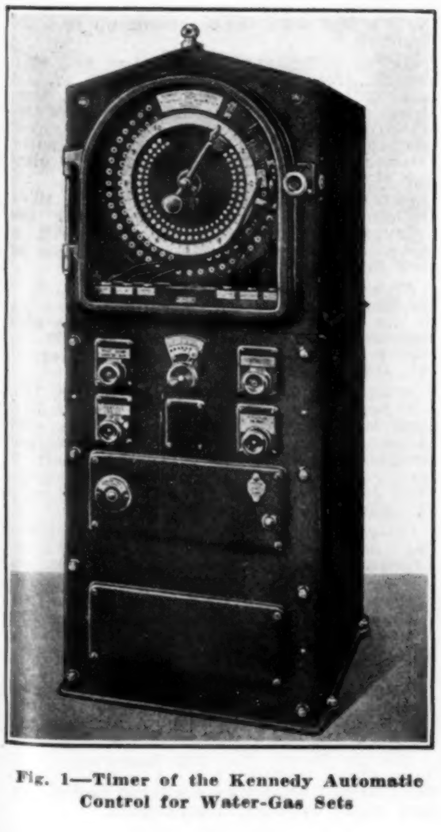


Fig. 1—Timer of the Kennedy Automatic Control for Water-Gas Sets

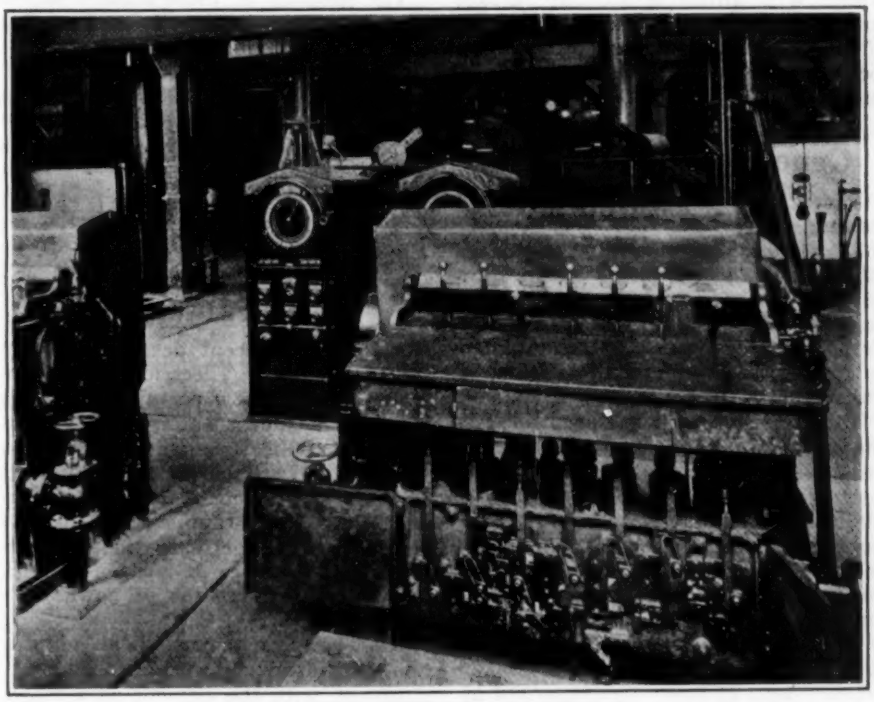


Fig. 2—The Controller of the Kennedy Automatic Control With Interlocking Switches Exposed

The timer, shown in the accompanying cut, Fig. 1, is provided with a dial graduated from zero to 10 minutes in 15-second intervals. Around the outside of this time dial are annular rows of receptacles. The electric connections of the controller are provided with suitable plugs which may be plugged into the appropriate receptacle. As the cycle proceeds, the pointer on the dial, starting from zero, revolves toward 10 in quarter-minute steps.

During the course of this revolution, as the pointer comes opposite the plugs, the electric connection is completed, which causes the controller to operate the proper valve, each in its proper sequence. By noting the position of the pointer, the progress of the cycle of operations is at once evident. Changes in the cycle can be made while operation is in progress, simply by shifting the position of the plugs.

The timer is designed to insure safe operation. Should a valve fail to operate, even partly, at the proper time, further operation is prevented and the set is shut down, while an alarm rings to call the attendant. The position of the dial arm indicates the valve that caused the trouble. Should an accident to the plant require an emergency shutdown, this may be done immediately by operating a push button on the timer. Other variations in operation are provided for by the switch knobs shown on the timer casing. A coaling signal and a counter to register total number of dial revolutions are part of the equipment.

The controller, shown in Fig. 2, consists of hydraulic cylinders which will operate any lever type of hydraulic control nest. In the cut it is shown attached to such a nest with the interlocking safety switches exposed. These interlocks are operated by the valves of the set and are the feature that insures safety, for, it is claimed, they prevent any valve in the set operating unless that immediately preceding in sequence has successfully and completely operated.

Improved Air Compressor

The Sullivan Machinery Co., Chicago, Ill., announces that it has redesigned its familiar and widely used "Angle Compound" type of air compressor. These improved machines, which are now ready to be placed on the market, are built in seven sizes, giving a range in single machines from 450 to 1,700 cu.ft. of free air per minute, and in twin machines up to 3,700 cu.ft. of free air per minute. The pressure range is up to 120 lb. per sq.in.

The principal improvements are in the valves and in the intercooler. The valves are of the type known as the "Sullivan Double Wafer Valve." The inlet and discharge valves are seated in pairs in tandem, one pair in each port, providing large valve area and small clearance space. They are actu-

ated by the pressure of the air itself and do not derive their opening or closing movement from any mechanical action of the compressor.

The new intercooler is of the three-pass counter-current type. It consists of a substantial, rectangular, cast-iron shell divided into three compartments containing copper or aluminum tubes, which will afford a cooling surface sufficient to produce thorough cooling of the first stage compressed air. It is located immediately over the low-pressure cylinder and frame.

General Utility Loader

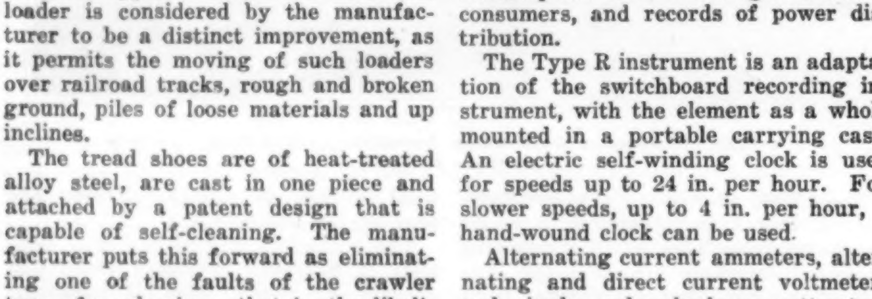
Those companies interested in the loading of various kinds of broken solid material in the plant yard, or other storage space, into trucks or cars will find a new type of machine for this purpose presented in the "Crawler Tread Portable Loader" recently placed on the market by the Link-Belt Co., of Philadelphia, Pa.

This new industrial loader, which is shown in the accompanying photograph, is known as the "Grizzly." The distinctly new feature of this loader is the crawler tread. This type of tread has proved successful on other machines and its application to the industrial loader is considered by the manufacturer to be a distinct improvement, as it permits the moving of such loaders over railroad tracks, rough and broken ground, piles of loose materials and up inclines.

The tread shoes are of heat-treated alloy steel, are cast in one piece and attached by a patent design that is capable of self-cleaning. The manufacturer puts this forward as eliminating one of the faults of the crawler type of mechanism—that is, the likelihood to clog with dirt, sand and mud.

In addition to the crawler features of this loader, other advantages put forward are the solid cast-steel lower base and the ability of the loader to swivel and swing independently of the base. The steering mechanism is controlled by a hand wheel, all other operations being controlled by levers located on the operator's platform on the upper swiveling frame.

The capacity of these loaders varies with the material handled. For this size, with bituminous coal, the manufacturers claim a capacity of 45 cu.ft. per minute. About the same capacity is given for sand, and a capacity of 40 ft. per minute for crushed-rock products of 1½-in. size and less.



Link-Belt Crawler Tread Portable Loader

Portable Recording Instruments

Among the recent developments by the Westinghouse Electric & Manufacturing Co. is a new portable recording instrument known as Type R. It is made for applications where records as accurate and reliable as those obtained with large switchboard instruments are necessary. Such applications include analysis of motor operation, typical consumption curves of large industrial consumers, and records of power distribution.

The Type R instrument is an adaptation of the switchboard recording instrument, with the element as a whole mounted in a portable carrying case. An electric self-winding clock is used for speeds up to 24 in. per hour. For slower speeds, up to 4 in. per hour, a hand-wound clock can be used.

Alternating current ammeters, alternating and direct current voltmeters and single and polyphase wattmeters are made in these portable recording instruments.

Type R Portable Recording Wattmeter Three-Phase, A-C

Catalogs Received

DE LAVAL STEAM TURBINE Co., Trenton, N. J.—Catalog B. This is a new general catalog covering the full line of De Laval centrifugal pumps. It covers the De Laval manufacturing facilities, design details of different styles of centrifugal pump and is well illustrated with installation views.

SULLIVAN MACHINERY Co., Chicago, Ill.—Form 1594. A catalog describing the new class "WJ-3" angle-compound belt-driven air compressor, which is built in numerous sizes for stationary work.

FILES TEMPERATURE CONTROL Co., Bridgeport, Conn.—Folder No. 1. A folder describing the new Files design of temperature controller.

FULLER-LEHIGH Co., Fullerton, Pa.—A catalog entitled "Fuller-Lehigh Equipment for Producing Pulverized Material," which describes the line of equipment and machinery manufactured by this concern for pulverizing materials, including the Fuller-Kinyon conveying system.

PHILIP CAREY Co., Lockland, Cincinnati, Ohio — Bulletin 101. Pamphlet entitled "High-Temperature Heat Insulation," describing the properties and uses of Carey "Hi-Temp," a new high-temperature insulation for use with temperatures up to 1,000 deg. F.

SMITH & SERRELL, Central Ave. and Halsey St., Newark, N. J.—Bulletin 37. A catalog giving full data as to size, construction, applications and method of installation of the well-known "Francke" flexible coupling, also special instruction relative to use in chemical plants and similar places.

SULLIVAN MACHINERY Co., Chicago, Ill.—Bulletin 81-C. A catalog describing the Sullivan "DW-64" water hammer drill, a mounted machine for the heavier kinds of rock drilling.

STEERE ENGINEERING Co., Detroit, Mich.—Pamphlet 255. A leaflet calling attention to the recent report of the American Gas Association on the operation of the "Back-run" gas process at station J of the Detroit City Gas Co.

ALEXANDER MILBURN Co., Baltimore, Md.—A booklet describing the full line of Milburn welding and cutting apparatus and accessories such as acetylene generating equipment. Also another booklet setting forth the Milburn acetylene lighting equipment for outdoor and temporary work such as quarries and mines.

OILGEAR Co., Milwaukee, Wis.—Bulletin 30. A leaflet announcing a new line of hydraulic presses, 15, 25 and 50 ton capacities.

ESTERLINE-ANGUS Co., Indianapolis, Ind.—Bulletin 1223. A booklet announcing the removal of this company's business to its new plant in Indianapolis and a description of this plant.

THE DURIRON Co., Dayton, Ohio—Bulletin 132. A catalog of kettles, plain and jacketed; tanks; pots and accessories of Duriron.

ROLLER SMITH Co., 233 Broadway, New York City—Bulletin 210. A catalog of direct-current portable ammeters, voltmeters, and other electrical instruments.

Review of Recent Patents

Dye-Manufacturing Processes

Group of Patents Assigned to National Aniline & Chemical Co. Indicates Trend of Research in Dye Industry

IN Patent 1,478,015, granted Dec. 18, 1923, and assigned to National Aniline & Chemical Co., Don W. Bissell, of Buffalo, N. Y., describes the manufacture of a triphenylmethane dye from the disulphonic acid of 3-hydroxy-4' . 4"-tetraethyldiaminotriphenylmethane.

Nine hundred pounds of water is agitated in a wooden vat and the leuco disulphonic acid is slowly added in the form of the moist hydrated crystals and in amount equivalent about 261 lb. of the anhydrous product. The addition is made slowly in order to get a good suspension, and about 41.5 lb. of caustic soda is then added in the form of a 40-deg. Bé. solution. This results in dissolving the sulphonic acid of the 3-hydroxy-4' . 4"-tetraethyldiaminotriphenylmethane in the form of the sodium salt. When solution is complete, about 484 lb. of glacial acetic acid is added to the solution. About 110 lb. of lead peroxide (PbO_2) is made into a paste with water—for example, a paste containing from 15 to 50 per cent of the lead peroxide—and this paste is slowly added to the acetic acid solution over a period of about 5 to 10 minutes. The solution is agitated during the addition, and the oxidation takes place rapidly. Under the conditions given, the leuco acid, as well as the oxidation product, remains in solution. The amount of lead peroxide required for the oxidation can be ascertained by the colorimeter on an aliquot portion of the solution, so that both underoxidation and objectionable overoxidation will be avoided. After the completion of the oxidation, and while the agitation is continued, there is added about 94 lb. of anhydrous sodium sulphate, or the equivalent of the crystalline sodium sulphate, and the stirring is continued until the lead is completely precipitated as lead sulphate. The subsequent filtration of this precipitated lead sulphate can be greatly facilitated by the addition of a small amount—for example, 25 lb.—of amorphous silica. The solution is then filtered in a filter press and the filtrate collected and cooled to a temperature of 0 deg. C.; 230 lb. of caustic soda, in the form of a 40 deg. Bé. solution, is then added, while keeping the temperature under 20 deg. C. The solution is then allowed to stand, with agitation, for a period of several hours, to permit crystallization of the dyestuffs, which is then filtered out in a filter press and washed with a saturated salt solution and then dried at a temperature of about 70 to 90 deg. C.

Dibenzanthrone Vat Dye

Lloyd C. Daniels and Winthrop S. Lawrence, of Buffalo, N. Y., have found that the vat dye produced by caustic fusion of benzanthrone is a composite product containing a non-vatable byproduct. The latter may be removed by a process outlined in Patent 1,478,027, granted Dec. 18, 1923, and assigned to National Aniline & Chemical Co.

A mixture of 100 parts of caustic potash and 420 parts of mineral oil having a boiling point of about 230 deg. C. and obtained from steam-distilled kerosene is heated to 215-230 deg C., and to this heated mixture is gradually added with agitation an intimate mixture of 24 parts of dextrine and 100 parts of sublimed benzanthrone, and the resulting mass is maintained at this temperature until the reaction is completed.

Upon completion of the reaction, the reaction mixture is treated to remove the mineral oil therefrom and to separate the vatable dye from the nonvatable byproduct. This may advantageously be effected by blowing the fusion product from the fusion kettle directly into an iron tank containing 12,000 to 16,000 parts of 2 per cent caustic soda solution containing about 2 grams of hydrosulphite per liter. The kerosene will separate as a protecting layer, while the dilute alkali solution will serve to dissolve the vatable constituent of the composite product and the hydrosulphite used will protect it from oxidation by oxygen dissolved in the water. The solution can then be heated to 66-70 deg. C., filtered from the undissolved byproduct, and the filtered cake washed with a further amount of dilute alkaline hydrosulphite solution heated to about 60-70 deg. C. The dye is then precipitated from the solution by boiling and by aëration—that is, by blowing air through the solution until all of the dye is precipitated. The dye is then filtered off and washed free from alkali and can then be made into a paste, or it may be dried at 100 to 125 deg. C. for use as a powder.

The vatable dye thus obtained has a greatly increased strength as compared with the dye produced by the caustic fusion of benzanthrone, without the isolation and purification above described.

Triarylmethane Dye

Lucas P. Kyrides, of Buffalo, N. Y., describes a new acid dyestuff belonging to the triphenylmethane series in Patent 1,478,039, granted Dec. 18, 1923, and assigned to National Aniline & Chemical Co.

American Patents Issued January 1, 1924

The following numbers have been selected from the latest available issue of the *Official Gazette* of the United States Patent Office because they appear to have pertinent interest for *Chem. & Met.* readers. They will be studied later by *Chem. & Met.'s* staff, and those which, in our judgment, are most worthy will be published in abstract. It is recognized that we cannot always anticipate our readers' interests, and accordingly this advance list is published for the benefit of those who may not care to await our judgment and synopsis.

1,479,042—Emulsion and Process of Making Same. Lester Kirschbraun, Chicago, Ill.

1,479,047-8 — Gritless Carboniferous Ink and Method of Making Same. Walter W. Mock, Rutherford, N. J.

1,479,088—Heat Exchanger. Joseph Schneible, Chicago, Ill.

1,479,096—Safety Device for Centrifugal Pumps. Peter Ibach, Konigswinter, Germany.

1,497,107. Refractory Composition. John L. Ohman, deceased, late of Niagara Falls, N. Y.; by Charles A. White, administrator, Buffalo, N. Y., assignor to Buffalo Refractory Corporation, Buffalo.

1,479,143—Electric Resistance Furnace. George M. Little, Pittsburgh, Pa., assignor to Westinghouse Electric & Manufacturing Co.

1,479,145—Extraction of Soluble Constituents of Materials. Joseph McMahon and James A. McMahon, Brooklyn, N. Y.

1,479,189—Detanning Apparatus. Alfred Laukhuff, Shorewood, Wis., assignor to Albert O. Trostel, Milwaukee, Wis.

1,479,270-1—Method for the Removal of Suspended Material From Gases. Edson R. Wolcott, Los Angeles, Calif., assignor to International Precipitation Co., Los Angeles.

1,479,330—Plastic Product. Walter O. Snelling, Allentown, Pa.

1,479,347—Method for the Heating of Melting Furnaces or the Like. Eduard Weymann, Dortmund, Germany, assignor to Eisen- und Stohlwerk Hoesch Aktiengesellschaft, Dortmund, Germany.

1,479,368—Brickkiln. Baptiste F. Canavera, St. Louis, Mo.

1,479,419—Method of Preserving Bagasse Fibers and a Bale Thereof. Treadway B. Munroe, Chicago, Ill., assignor to C. F. Dahlberg, Minneapolis, Minn.

1,479,472—Glue and Method of Preparing the Same. William R. Long, St. Louis, Mo.

1,479,511—Means for Stirring Glass. Charles Algernon Parsons, Newcastle-on-Tyne, England.

1,479,540—Pulverizer. Paul Arthur Hirsch, Erie, Pa., assignor to Furnace Engineering Co., New York.

1,479,582—Induction Furnace. Charles A. Brayton, Jr., Cleveland, Ohio, assignor to the Induction Furnace Co., Cleveland.

1,479,731—Process for Detinning Iron. John Stanley Morgan, London, England, assignor to Thermal Industrial & Chemical (T. I. C.) Research Co., Ltd., London.

1,479,747—Lignite Briquet. Thomas Joseph Setchell, St. Paul, Minn.

1,479,776—Apparatus for Cracking and Distilling Oils. Joseph George Davidson, Pittsburgh, Pa., assignor to Charles H. Conner, New York.

1,479,777—Centrifugal Pump. William Hebard, Winnemucca, Nev.

Complete specifications of any United States patent may be obtained by remitting 10c. to the Commissioner of Patents, Washington, D. C.

The following method illustrates the manufacturing procedure: 90 parts of N-hydroxyethylbenzylaniline is heated with 52 parts of benzaldehyde-2.5-disulphonic acid and 1,000 parts of water in a vessel provided with a reflux condenser for 30 hours at boiling temperature, the mixture being constantly stirred. When the condensation is complete, the reaction product, which consists chiefly of the leuco compound, is filtered off and washed with water. The product is then suspended in 500 parts of water and, while stirring, sodium hydroxide solution is slowly added until the solution becomes slightly alkaline in reaction and the leuco compound has dissolved. The solution is then filtered and the filtrate extracted once or twice with benzene in order to remove any N-hydroxyethylbenzylaniline which may be present. The leuco compound is then precipitated from the aqueous solution by the addition of dilute sulphuric acid, and is filtered off and washed. The leuco compound may be converted into the dyestuff by oxidation in the following manner: 68.4 parts of this leuco compound is dissolved in 900 parts of water containing sufficient sodium hydroxide to effect solution and render it slightly alkaline toward phenolphthalein as indicator. Forty parts of lead peroxide of 60.34 per cent purity and 1,000 parts of water are then added to the well-stirred solution, and then 50 parts of glacial acetic acid. After stirring for about 20 to 25 minutes, 40 parts anhydrous sodium sulphate are added, and the stirring continued for about 10 minutes longer. The lead sulphate is then filtered off and the dyestuff salted out from the filtrate by the addition of common salt. It is filtered off, washed and dried. In the dry and powdered state, it is a blue powder with a reddish tinge, easily soluble in water or in alcohol, with a greenish-blue coloration. It dyes from an acid bath a greenish blue on silk or wool.

Indanthrene Yellow G

Improvements in the manufacture of indanthrene yellow G are noted by Donald G. Rogers and Harold T. Stowell, of Buffalo, N. Y., in Patent 1,478,061, granted Dec. 18, 1923, and assigned to National Aniline & Chemical Co.

One hundred parts of beta-aminoanthraquinone (100 per cent basis) in a finely powdered condition are well suspended at room temperature in 1,200 parts of nitrobenzene, and 350 parts of antimony pentachloride are added slowly with vigorous agitation, the temperature rising of itself to 60-75 deg. C. The charge is then rapidly heated during a period of about 10 to 20 minutes to 145-150 deg. C. and is held there for about 45 minutes. It is then cooled to 35 deg. C. with agitation, over a period of about 1 to 2 hours, and the resulting mixture is then filtered. The treatment thus described results in the production of the flavanthrone antimony pentachloride salt which is filtered out in a crude state. The mother liquor is further cooled and crystallized to give a green dye, containing both flavanthrone and a blue dye, which may be subsequently purified.

The crude product—that is, the flavanthrone antimony pentachloride salt—after it has been isolated by filtration, is then stirred into 1,000 parts of fresh nitrobenzene and heated to about 100 deg. C., then cooled to about 20 deg. C. and filtered, and the residue then washed with 200 parts of nitrobenzene and sucked or blown as dry as possible. The filtrates thus obtained can be used for the next dye formation batch. The treatment of the crude product in the manner thus described results in its purification, so that the product produced by the last filtration is the purified flavanthrone antimony pentachloride salt. This purified salt is then decomposed or hydrolyzed and converted into the flavanthrone dye by dissolving it at room temperature, or above, in about 300 parts of sulphuric acid at 66 deg. Bé., and pouring the solution into 3,000 parts of water with vigorous agitation. The precipitated dye is filtered out and washed acid-free with warm water, this treatment giving the dye in the form of a finely divided smooth uniform paste suitable for use.

Book Reviews

Commercial Marine Products

MARINE PRODUCTS OF COMMERCE. By *Donald K. Tressler*, in collaboration with seventeen specialists. 760 pages, 300 illustrations. Chemical Catalog Co., New York. Price, $9.

More than 300,000,000 cubic miles of sea water is quite a volume, and the chief author of this book and his seventeen collaborators have taken 762 pages to discuss the market products that it yields. Whales, shrimps and green turtles; salt, edible seaweeds and kelp; pearls, mother-of-pearl and coral, with fishes of all shapes and dispositions, as well as fish oil, glue and isinglass, are only a few of the subjects that receive attention. The book is for scientist and practical man alike. No salt-water Izaak Walton should be without it. It attempts, as the preface says, to give the chemist and biologist a general survey of the fishery industries—their importance, location and methods used—and the authors have used language that can be readily understood. Altogether they have succeeded in turning out a most readable handbook, profuse in illustrations, with something on almost every page that is sure to catch the eye, even as one thumbs casually through it. From the time when Jonah had relations with a whale—and even before, no doubt—there has been an intimate bond of interest between man and the sea. The questions we have asked of bay men and deep sea fishermen from time to time about the denizens of local waters, often without an intelligent reply, find answer here.

Especially interesting are the three chapters by Dr. George F. Kunz, of Tiffany's, on pearls, real and artificial, mother-of-pearl and the precious coral industry. Pearl essence, we learn, which makes the artificial and "indestructible" pearl possible, is also a product of the sea. Other chapters are devoted to discussion of processes of recovering iodine and potash from seaweed and kelp, the manufacture of alginic acid, various fish and liver oils, fertilizer, fish meal and glue. Those who think that isinglass means mica only may be interested to read here of the gelatin of that name that is prepared from fish-sounds, which reminds one of the story that even the pig squeal is utilized today. Here and there certain captions catch the browser's eye, such as "Habits of the Adult Lobster," and then again something about the Sheik of Bahrein invites closer perusal.

Problems of the fishery industries are briefly outlined in a chapter toward the end of the book. These are problems that confront the researcher who is studying ways of improving fishery products and utilizing byproducts. It is evident that a great field for endeavor here awaits the chemist and scientist in their effort to make the ocean contribute more to the welfare of mankind.

Each chapter terminates with a bibliography of the subject it discusses. A glossary, at the end, is a useful feature. All in all, the book is very much worth having.

A. H. HUBBELL.

Rickard's Technical Writing

TECHNICAL WRITING. By *T. A. Rickard*. Revised edition, 337 pages. John Wiley & Sons, New York. Price, $2.

Probably no other engineering editor in America could write a book on English composition that is so stimulating and valuable as this; and probably no other work on English composition is capable of arousing such violent disagreement in the reader. The book is original and incisive; it breaks new ground, and there was widespread need for such a set of rules and suggestions for technical writing. But the author is crotchety and hair-splitting to an extent that arouses impatience and ire. Perhaps it is well that he is, for the engineering profession needs to be aroused over its muddling of the English language. The engineering societies of America should send Mr. Rickard a vote of appreciation for his influence in improving technical English.

The revised edition has been much improved and amplified. Only four

chapters of the first edition have been kept approximately as they appeared in 1919; the thirteen other chapters have been rewritten or added as new. Probably an unsympathetic or narrow-minded critic could search the pages and find cases of the author's inconsistency or finical eclecticism. But the good parts of the book outweigh the bad. Mr. Rickard is particularly praiseworthy in his trenchant condemnation both of pompous verbosity and barbarous slovenliness. He upholds naturalness, clearness and precision in as glorious a manner as a knight battling for the Holy Grail. His explanations of the use of the relative pronoun "that" and of the hyphen in technical terms deserve the thanks of rhetoricians. And his frontal attack on superlatives and the superfluous, jargon in general, and prepositional verbs, should endear him to editors.

In brief, the book is an important, scholarly and distinctly human piece of work. Every engineer and every editor should possess a copy.

P. B. McDONALD.

Design and Operation of Byproduct Coke Equipment

BYPRODUCT COKING. By the late *G. Stanley Cooper*. Second edition, enlarged and completely revised by *Ernest M. Myers*. 192 pages. Benn Brothers, Ltd., London. Price, 12s. 6d. D. Van Nostrand Co., New York. Price, $4.50.

Perhaps as important in the working equipment of an engineer as any other thing is a knowledge of the "prior art," as the patent lawyers say, of his specialty. If one is to specialize in byproduct coke-oven plant work, either design or management, it is absolutely necessary to know what has been tried in the past and by what ways and means present accepted practice was derived.

For this phase of the study of coking we can sincerely recommend the second and revised edition of the late G. S. Cooper's work. The history of both the coke-oven and the byproduct plant is given in an interesting, readable manner. And the numerous illustrations of the various types of equipment help to make these chapters clear. Here is a real need well filled.

The book closes with a chapter on the future development of the industry, which covers present trends in a stimulating way. A chapter on chemical tests covers, in a manner adequate for everyone except the plant chemist himself, the routine tests that must be carried out in each plant to insure successful operation.

So much is good. But when one considers the portion of the book that covers operating and design there are two distinct drawbacks—at least from the American point of view.

In the first place the compass of the treatment is too small to give the adequate practical instruction which the American coke-oven operator — generally a practical man—likes to see. For instance, the chapter on the working of a byproduct coke oven covers only nine small pages, coal and the coke handling and gas exhausters are covered in a single chapter twenty-one pages long, the whole subject of tar and ammonia recovery is dealt with in thirty-two pages, and benzol recovery and tar distillation cover but ten pages each. These are but little more exhaustive in their treatment than a short article in a technical journal. What the operator wants is a manual that will be a true guide.

The other drawback is one that is entirely due to the differences between American and British practice. In Britain little is made so far of coke-oven gas as a domestic fuel and British practice therein varies from ours. Also, the silica-brick walled oven is just beginning to be heard from over there and the whole practice as to coking time, heats and oven economy is for this reason different.

But even with these faults from an American standpoint acknowledged, the book has real value for the coke plant engineer. It will give him a historical background for his work that he needs. And it will allow him to check British practice against his own—a process which cannot fail to be of sufficient value to warrant a careful reading of the book. GRAHAM L. MONTGOMERY.

Books Received

Economics of Steam Production

SUPERVISION AND MAINTENANCE OF STEAM-RAISING PLANT. By *Charles A. Suckan*. 342 pages, illustrated. Ernest Benn, Ltd., London. Price, 36 shillings.

Too frequently the boiler plant is looked upon as a necessary evil rather than as a productive department in which air, water and fuel are used as raw materials to make steam of a standard quality. Viewed from the latter angle, it is at once evident that the problems of the boiler plant deserve the same careful attention that is given to the remainder of the factory. This book shows how the cost of steam can be reduced by scientific management and control of the steam-producing department.

Paint and Varnish

CHEMISTRY OF PAINTS, PIGMENTS AND VARNISHES. By *J. Gauld Bearn*, chief chemist, Walter Carson & Sons. 277 pages, illustrated. Ernest Benn, Ltd., London. Price, 30 shillings.

Modern technical processes for the manufacture of pigments, paints and varnishes are treated in this book so as to give a comprehensive survey of the technology of the entire industry at the present time. Emphasis is of course placed on chemistry rather than on details of mechanical equipment, although the latter is by no means neglected. Users, as well as manufacturers, will find the book most valuable in answering practical questions on the raw materials or finished products of these industries.

Wood Distillation

CHEMICAL UTILIZATION OF WOOD IN WASHINGTON. By *Henry K. Benson*, professor of chemical engineering; *Thomas G. Thompson*, associate professor of chemistry, and *George S. Wilson*, associate professor of mechanical engineering, University of Washington. Engineering Experiment Station Series, Bulletin No. 19, 160 pages, illustrated. Obtainable from the Director, Engineering Experiment Station, University of Washington, Seattle, Wash. Price, 75 cents.

An extremely interesting review of the work that has been done at the University of Washington toward the utilization of wood and wood waste for the production of derived products. The methods discussed include: steam distillation and extraction of resinous woods yielding temperature and rosin;

Important Articles in Current Literature

More than fifty industrial, technical or scientific periodicals and trade papers are reviewed regularly by the staff of *Chem. & Met.* The articles listed below have been selected from these publications because they represent the most conspicuous themes in contemporary literature, and consequently should be of considerable interest to our readers. A brief résumé of each article is included in the reference given. Since it is frequently impossible to prepare a satisfactory abstract of an article, this list will enable our readers to keep abreast of current literature and direct their reading to advantage. The magazines reviewed have all been received within a fortnight of our publication date.

TYING GRAY OR WHITE CAST IRON IN KNOTS. *Bradley Stoughton*. A description of a new simple heat-treatment effecting a radical transformation resulting in greatly improved machinability and other remarkable properties. *Iron Age*, Jan. 3, 1924, pp. 15-21.

STRUCTURES OF GRAY IRON AND SEMI-STEEL. *J. W. Bolton*. The first part of a discussion of the make-up of these metals, with some stress on the recently increased value of this knowledge to the foundryman. *Iron Age*, Jan. 3, 1924, pp. 47-49.

IRON AND STEEL METALLURGY IN 1923. *C. E. MacQuigg*. A review of the year's developments in fuels and furnaces, iron and steel, alloys and castings. *Iron Age*, Jan. 3, 1924, pp. 77-78.

TREATMENT OF SPENT SODA LIQUOR. *G. K. Spence*. An outline of the methods used in washing, evaporation and burning the liquor for the recovery of the soda, including leaching the black ash, causticizing the carbonate liquor and disposing of the lime sludge. *Paper*, Dec. 27, 1923, pp. 7-10.

WHERE LOW-TEMPERATURE DISTILLATION STANDS. *C. H. S. Tupholme*. An account of what the present state of this process indicates to be its industrial future. *Combustion*, January, 1924, pp. 57-59.

CO-ORDINATION OF PRODUCTION WITH SALES FOR OIL COMPANIES. *E. G. Reynolds*. A suggested method by which oil refiners can determine the quantity of their production to meet sales possibilities. *Management & Administration*, January, 1924, pp. 85-89.

VARNISH COOKING, USING SURFACE COMBUSTION EQUIPMENT. *Arthur M. Apmann*. An article giving operating data and comparing oil, coke and gas as fuels. *Gas Age-Record*, Jan. 5, 1924, pp. 19-21.

destructive distillation yielding charcoal, tar, methanol, etc.; extractions of bark for tanning materials; pulp and paper manufacture; producer gas; and a number of minor uses which occur in the manufacture of such products as oxalic acid, ethyl alcohol, plastics, etc.

Costs for Executives

INDUSTRIAL COST ACCOUNTING FOR EXECUTIVES. By *Paul M. Atkins*, School of Commerce and Administration, University of Chicago. 322 pages, illustrated. McGraw-Hill Book Co., New York. Price, $4.

A clear practical discussion of how cost records aid the executive in the control of a business. The book explains fully the method of operating practical cost-accounting systems as well as the executive uses of such cost records.

Rare Metal Analysis

ANALYTICAL METHODS FOR CERTAIN METALS. By *R. B. Moore and associates*. Bulletin 212, Bureau of Mines. 325 pages. Available for purchase at 40c. each, paper bound, Government Printing Office, Washington, D. C.

This bulletin represents a splendid résumé of analytical methods for many of the rare metals that have attained very great importance industrially, especially through the development of alloy steels. Industrial chemists particularly will welcome this critical compilation; and it will serve widely in research and college laboratories as well. The principal elements considered are: Cerium, thorium, molybdenum, tungsten, radium, uranium, vanadium, titanium and zirconium.

Calendar

AMERICAN CERAMIC SOCIETY, Atlantic City, N. J., Feb. 4 to 9.

AMERICAN CONCRETE INSTITUTE, annual meeting, Chicago, Feb. 25 to 28.

AMERICAN INSTITUTE OF MINING AND METALLURGICAL ENGINEERS, New York City, Feb. 18 to 21.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS, annual meeting, New York City, Jan. 22 to 25.

AMERICAN SOCIETY OF SAFETY ENGINEERS, annual meeting, New York City, Jan. 18.

AMERICAN SOCIETY FOR STEEL TREATING, winter sectional meeting, Hotel Seneca, Rochester, N. Y., Jan. 31 and Feb. 1.

CANADIAN NATIONAL CLAY PRODUCTS ASSOCIATION, Prince George Hotel, Toronto, Ont., Feb. 13 and 14.

COMMON BRICK MANUFACTURERS' ASSOCIATION, Biltmore Hotel, Los Angeles, Calif., Feb. 11 to 14.

COMPRESSED GAS MANUFACTURERS' ASSOCIATION, New York, Jan. 21.

ENGINEERING INSTITUTE OF CANADA, annual general meeting, Montreal, Jan. 22, and Ottawa, Jan. 23 and 24.

FRANKLIN INSTITUTE, annual meeting, Philadelphia, Jan. 16.

NATIONAL SAFETY COUNCIL, ENGINEERING SECTION, jointly with AMERICAN SOCIETY OF SAFETY ENGINEERS. New York City, Jan. 18.

SOCIETY OF AUTOMOTIVE ENGINEERS, annual meeting, simultaneously with the Detroit Automobile Show, General Motors Bldg., Detroit, Mich., Jan. 22 to 25.

TAYLOR SOCIETY. Regular meeting. Engineering Societies Bldg., New York, Jan. 24 to 26.

Men in the Profession

R. A. ALLEN, metallurgist of the Rolls-Royce Co. of America, spoke Jan. 8 at the Hartford, Conn., chapter of the American Society for Steel Treating on "The Inspection of Steels Used in Automotive Construction."

Dr. D. C. BARDWELL, a Bureau of Mines chemist, has been transferred from the experiment station at Reno to Washington, to do special work on radium and rare metals.

W. C. P. BETHELL has been appointed division manager of the Virginia-Carolina Chemical Co., with headquarters at Savannah, Ga., to succeed J. A. Reid, who resigned to engage in another branch of industry. Heretofore Mr. Bethell has been acting as assistant manager, and will be succeeded in this position by F. A. TUCKER, previously connected with the company at Columbia, S. C.

OLIVER BOWLES, the superintendent of the Bureau of Mines Experiment Station at New Brunswick, N. J.; W. H. COGHILL and W. M. WEIGEL, have returned from a field trip in connection with their study of the possibility of applying metalliferous ore-dressing methods to the non-metallics.

H. A. BROCHERS of the Department of Agriculture, Division of Chemistry, of California, has established offices at Visalia, to give expert advice to farmers and others in this section on the use of chemicals and fertilizers for soil service.

Dr. J. MCKEEN CATTELL, of New York, has been elected president of the American Association for the Advancement of Science, succeeding Prof. C. D. WALCOTT, secretary of the Smithsonian Institution, Washington, D. C.

S. J. CROOKER, who has been engaged at the semi-commercial helium plant of the Bureau of Mines at Fort Worth, is conferring with officials of the bureau in Washington.

W. B. CULLISON has resigned his position on the chemical staff of the Bureau of Mines to accept a place with the Greasoe Chemical Co. of Cleveland.

JAMES H. GRAHAM has been elected president of the Indian Refining Co., succeeding T. L. POMEROY, with offices at the main oil refinery, Lawrenceville, Ill., to which point the company will remove its headquarters, heretofore located at New York.

ARTHUR V. HENRY, of Ohio State University, has been appointed head of the new ceramics department at Georgia School of Technology, Atlanta, Ga. Mr. Henry was graduated from Ohio State University as ceramic engineer in 1914 and has completed post-graduate studies in ceramics leading to the degree of Ph.D. which will be conferred before he takes up his new duties on **Feb. 1.**

S. S. HOWELL, who for the past 9 years has been identified as engineer in chief with the United Chemical & Organic Products Co. and the Central Chemical Co., both of Hammond, Ind., has announced that he will resume his private work as consulting engineer, with office in Chicago. He is retained as advisory engineer to the companies mentioned.

WILLIAM H. LOWE, general manager of a number of divisions of the Paraffine Companies, Inc., San Francisco, Calif., has returned to his desk after a 3 months absence in Europe, the majority of the time being spent in England and France.

A. J. MCNAB has been elected vice-president and director of the Magma Copper Co., New York, succeeding FRANK W. HOLMES.

FREDERICK MASON, vice-president of the American Sugar Refining Co., New York, has been elected president of the Franklin Sugar Refining Co., Philadelphia, Pa., an affiliated organization, to succeed GEORGE H. FRAZIER, who has resigned to retire from business. Mr. Mason will continue his headquarters at New York. ROBERT M. PARKER has resigned as vice-president of the American company, to become president of the Sugar Export Corporation, another subsidiary, with headquarters at 113 Wall St., New York.

LESTER PEABODY, for a number of years connected with the National Calfskin Co., has become superintendent at the plant of the Griess-Pfleger Tanning Co., Peabody, Mass.

Miss MABEL REAST of Whitesboro, Tex., has been appointed instructor in chemistry on the faculty of the College of Industrial Arts, Denton, Tex., and will take up her work with the institution immediately. Miss Reast holds a Bachelor of Science degree from Trinity University, Tex.

A. P. SPOONER has been appointed head of the metallurgical department of the Bethlehem Steel Co., Bethlehem, Pa., succeeding ROBERT M. BIRD, resigned, following a connection with the company of about 22 years. Mr. Bird will enter business in the near future in Philadelphia, Pa.

S. D. SURTEES, formerly chemist for the White Eagle Oil & Refining Co., is now chemist for the Shell Co. of California.

GEORGE H. SWIFT, formerly president of the National Leather Co., Boston, Mass., has been elected chairman of the board of directors. He will be succeeded as president by W. R. FISHER, heretofore vice-president.

JACQUES S. WEINBERGER has become chairman of the executive committee of the California Petroleum Corporation, with headquarters at Los Angeles.

News of the Industry

Summary of the Week

New offer made by Southern power companies for Muscle Shoals would give government $100,000,000 over period of 50 years.

Outlook of rubber industry for 1924 improved, according to reports from many plants.

International Combustion Utilities Corporation wins important decision in patent priority dispute.

Commercial development of government controlled patents is urged by Interdepartmental Patents Board.

Daugherty in letter to Hoover opposes the gathering of statistics by trade associations unless they are revealed only to government.

Government specialists hold that free entry for calcium arsenate would not benefit consumers.

Germany issues anti-trust decree terminating licences of all cartels and associations.

Interstate Commerce Commission rejects increase in freight rates on nitrate of soda from Gulf ports.

New Combination Offers $100,000,000 for Muscle Shoals Plants

Group of Southern Companies Would Also Provide Separate Operation of Nitrate Plant

NINE associated power companies of the South have made a tentative offer of $100,000,000 for Muscle Shoals with a provision making possible the manufacture of nitrate by Henry Ford. The offer was presented in a letter to the Federal Power Commission that has been made public by Representative Hull of Iowa, chairman of the House Military Affairs Committee.

The language of the offer describes the proposal as one "to permit the use of a substantial part of the power for the production of fertilizer; to place the Muscle Shoals power under the protection and regulation of the federal water-power act; to enable the government to collect during a 50-year period approximately $100,000,000 in rental and still retain ownership of all its properties."

Specific reservation is made of a certain amount of power for the manufacture of fertilizers under such terms as the government might describe.

Companies associated in making the offer to the Federal Power Commission are the Columbus Electric & Power Co., the Carolina Power & Light Co., the Yadkin River Power Co., the Asheville Power & Light Co., the North Carolina Electric Power Co., the Tennessee Electric Power Co., the Memphis Power & Light Co., the Alabama Power Co. and the Central Georgia Power Co.

The offer was made in response to a request from the federal commission to the companies for an estimate of what price the government probably could secure for the hydro-electric energy which will become available on completion of the Wilson Dam in July, 1925.

Mr. Hull, in commenting upon the offer, expresses a belief that it is the most practical solution of the Muscle Shoals problem that has been presented. He says in part:

"Any fair comparison of the terms of the proposed plan with the Ford offer on Muscle Shoals must serve to show the utter inadequacy of the latter, either from the standpoint of public benefit or of a return to the government on its $107,000,000 war-time investment there. Indeed, from almost any standpoint the Ford offer must now appear of doubtful possible benefit.

"The plan now proposed would enable the government to realize an adequate return on its investment, and at the same time retain Nitrate Plant No. 2 as a stand-by for war, the only assurance it now has for nitrate for explosives in event the national safety required. The government would retain also other very valuable properties, all of which under the Ford offer would be deeded to the Ford corporation for $1,500,000, when credit is given for proceeds of the Gorgas sale as proposed, although it now appears the government can realize $4,500,000 for the Sheffield steam plant alone.

"The government has sold the Gorgas plant for about $3,500,000, so it will be able to realize $8,000,000 for only two units of the Muscle Shoals properties. Yet Mr. Ford would pay only about $1,500,000 for the entire Muscle Shoals plants, which cost $107,000,000.'"

He continues: "I want the government to encourage him (Ford) or any one else, and afford every opportunity and assistance in the solution of this most pressing problem of the farmer.

"But if Mr. Ford is to engage in the fertilizer business, employing the resources of the government, it should be under the same guarantees that would be expected or asked of any other man.

"In any disposition of Muscle Shoals I regard these conditions as fundamental: First, the maintenance of the plants as preparedness against war; second, their utilization so far as practical in time of peace for the production of fertilizer; and third, the distribution of the power not so used to the public under regulations which will insure an adequate return on the investment in the power development."

Provision for Purchase

The offer proposes to take all responsibility for operation off the government's hands and furnish free power to operate locks needed to open the Tennessee River to navigation, the government, however, to assume operation of the locks.

The project would be subject to recapture by the government at the end of the 50-year lease as provided by the federal water-power law. The government would have the right to take possession of the property, whenever the safety of the United States demanded, for manufacture of nitrates, explosives or munitions.

Should the government decide to sell the hydro-electric plant, instead of leasing it, the offer declares that one or more of the nine companies joining in the offer would be prepared to submit a plan to purchase it and operate it under the federal water-power law.

Optimism Prevails in Rubber Industry

Increased Production Planned in Many Mills, With Prospect of General Improvement in All Lines of Activity

WITH rather spotted conditions in the rubber industry for a number of months past, the turn of the year is expected to bring about a marked revival of operations and expansions in this line, according to reports of prominent companies in different branches of production. Not only will outputs be advanced to close to normal schedules, with employment of larger working forces, but a number of new mills are being considered in different parts of the country.

The Republic Rubber Corporation, Youngstown, Ohio, has received a large order for mechanical rubber goods from the Ford Motor Co. and expects to advance manufacture at an early date to handle the contract, as well as for general market production. According to E. H. Fitch, president, the trend of the business indicates considerable improvement, with prospects for much better average output during 1924.

The Keystone Tire & Rubber Co., Bailey Ave. and 192nd St., New York City, has arranged to resume production at its plant and expects nearly normal operation soon. The company is reported to have enough orders to insure continuous operation throughout the year.

The B. F. Goodrich Co., Akron, Ohio, is now running at the rate of 18,000 tires per day at its local mills, a considerable increase over previous months. In its boot and shoe department, manufacture has reached a high level of 35,000 pairs a day, as compared with an output of about 20,000 pairs at this same time 2 years ago.

The Firestone Tire & Rubber Co. Akron, Ohio, is maintaining active production at its plants, with employment of a normal working quota of about 5,000 operatives. In an address to employees recently, Harvey Firestone, president, said there was a steady upward trend in business and the prosperity of the company in 1923 was expected to be duplicated this year.

The Woonsocket Rubber Co., Woonsocket, R. I., continues active, with employment of more than 1,900 persons. During the holidays the company distributed a bonus of $60,000 to this working force, which includes those at the branch mill at Millville, Mass., the sum being computed on 5 per cent of the payroll from June 15 to Dec. 15.

The Beacon Falls Rubber Shoe Co., Beason Falls, Conn., closed its plant during the holidays for 2 weeks, and has now arranged for resumption of production at close to regular schedule. Winter weather conditions up to the present time have been unfavorable to maximum output at this season.

The United States Rubber Co., New York, continues regular production at its different mills and expects to continue on the present basis for an indefinite period. The mechanical rubber goods division of the company is said to be active, and a 10 per cent advance in price on this line, in which cotton fabric and yarns are used, has now become effective.

German Decree Restricts Operations of Cartels

An anti-trust decree aimed at the cartels has been issued in Germany. This reflects the feeling of hostility of the German public, which has increased in intensity as inland prices have risen. The cartels and other associations are held responsible by the public for a material portion of these price advances. Small manufacturers are said to have assisted the movement so as to regain some of their former independence.

The decree was issued Nov. 2 by the Chancellor. It has all the force of law, however, and became effective Nov. 20. In the welter of more sensational events transpiring at that time in Germany, the decree seems to have been omitted in news dispatches.

The order resembles the Sherman anti-trust act in many respects. The licenses to all cartels have been terminated. The report on the subject to the Department of Commerce states that a special court was set up to consider matters pertaining to the cartels. There are to be no appeals from its decisions.

The administration of the decree is lodged with the Minister of Economics. No contract regulating production, distribution or sale of commodities may be entered into legally without his approval. At any time any contract should be found to be contrary to the public interest, the cartel court is empowered to issue injunctions that will prevent its being carried out.

So far as the chemical industry is concerned, it is pointed out in this country, there must be a continuance of some form of co-operation unless much of the present practice is revolutionized. As a result of the cartel system, there are few chemical plants in which all of the processes between the raw material and the finished product are carried out. Certain operations are conducted at one plant. The product then is sent to another for further processing. In some instances work is done in ten or twelve plants before the finished product is obtained. While this type of organization can be operated successfully where all the plants are under the same management, difficulties would be encountered were the cartel abolished. For that reason it is believed that the application of the decree will be such as to permit a continuance of the dye cartel, although it seems probable that its power has been curtailed.

Millikan Awarded Hughes Medal

Dr. Robert A. Millikan, chairman of the executive board of the California Institute of Technology, has been selected by the Royal Society of London as the recipient of the Hughes medal, in recognition of his work on the determination of physical constants. This honor from one of the foremost scientific bodies in the world, founded in 1660, follows close on the heels of the announcement that Dr. Millikan had been awarded the Nobel prize in physics.

Du Pont Makes Changes in Personnel

The following changes in technical men in Du Pont high-explosive plants are being made: Joe Hugher, assistant manager at Louviers, Colo., goes to a similar position at Du Pont, Wash., while O. S. Delancy, who has been acting assistant manager at the latter plant, becomes assistant manager at Louviers; George Leith, assistant powder superintendent at Du Pont, takes the position of powder superintendent at Louviers; A. A. Ratti, supervisor in the acid department at Barksdale, Wis., is transferred to a similar place at Repauno plant, Gibbstown, N. J.

Trade Notes

H. C. Baker, formerly with the meteor Products Co., has joined the forces of Eugene Suter & Co.

A merger has been made of the United States Gypsum Co., of Chicago, and J. B. King & Co. of New York.

The Fairmont Chemical Co. of Fairmont, W. Va., has been purchased by F. D. Fenhagen, who will continue operation of the plant as heretofore.

The Chemical Division of the Department of Commerce will issue on Jan. 15 its report showing imports of biological stains at the port of New York for November and December.

The Canada Independent Oil Co., Ltd., of St. John, N. B., has closed a contract to supply lubricating oils of all kinds to all Canadian Pacific Steamships plying to Atlantic ports. This is said to be the biggest contract for lubricating oils ever closed in Canada.

H. F. Pearsall, formerly connected with George F. Taylor & Co., has established the firm of Hamilton F. Pearsall & Co., with offices at 36 South William St., New York. The company will specialize in heavy and fine chemicals, fertilizer materials, and drugs.

Joseph C. Weston, president of the Ajax Rubber Co., has been elected chairman of the board of directors. Mr. Weston will continue to serve as president of the company.

Washington News

Patent Office Efficiency Being Built Up

A reduction of 12,035 in the number of patent, design and trademark cases up for action at the Patent Office has been effected during the past 3 months. On Sept. 21 there were 74,256 applications for patents on hand and on Dec. 21 there were 65,010 applications unacted upon, showing a net gain of 9,241. Applications of designs were reduced from 2,113 on the September date to 887 on Dec. 21, showing a decrease of 1,226. Action was also taken on 1,563 trademark applications, reducing the number on hand from 3,341 to 1,778. The Patent Office likewise reports that all applications on patents are being acted upon within 9 months at the present time, whereas a year ago a delay existed of 15 months. Applications for designs receive action within 10 weeks now, while a year ago it took 8 months. Trademark applications are being disposed of in 7 weeks. A year ago the Patent Office was so far behind in its work that it took more than 5 months to get final action on trademark applications.

Railroads Move Large Tonnage of Chemicals and Explosives

Chemicals and explosives contributed 2,049,099 tons to the revenue freight carried by Class 1 railroads of the United States during the quarter ended Sept. 30, figures just made public by the Interstate Commerce Commission show. This is in addition to the fertilizer tonnage, which aggregated 1,160,992.

Of the total amount of chemicals and explosives transported during the third quarter of 1923, 1,373,775 tons originated in the Eastern district (fertilizers, 1,415,278 tons); Southern district, 234,938 tons (fertilizers, 286,058 tons); Western district, 361,895 tons (fertilizers, 154,662); Pocahontas district, 78,491 tons (fertilizers, 37,241 tons).

Engineers Favor Mellon Plan

Membership in the American Institute of Mining and Metallurgical Engineers is giving unqualified indorsement to the Mellon plan of tax reduction urged upon Congress in the message of President Coolidge.

The replies received to an inquiry sent out by the board of directors, Secretary F. F. Sharpless announced, indicate that the members feel that the Mellon plan is drawn with a view to promoting industrial enterprise by discouraging the diversion of investments into tax-exempt securities, and that it is intended to relieve the burdens placed upon those with moderate incomes, comprising the vast majority of those in the engineering profession.

The Institute, which maintains local sections in mining and industrial centers all over the country, is the second of the big national engineering organizations formally to go on record in support of the Mellon plan. The American Society of Mechanical Engineers, through its Council, recently took similar action.

Bureau of Chemistry Studies Corn Products Explosion

Engineers of the Bureau of Chemistry, United States Department of Agriculture, have gone to Pekin, Ill., to assist officials of the Corn Products Co. in making a thorough investigation of the disastrous dust explosion on Jan. 3 that caused the death of between forty and fifty employees and several hundred thousand dollars property damage in their starch plant. G. M. Moffett, general manager of the company, made the request for a government study of the causes of the accident immediately after the news reached the New York office. The investigators include David J. Price, engineer in charge of development work for the Bureau of Chemistry, and Assistant Engineers Hilton R. Brown and Paul W. Edwards.

Records kept by the Department of Agriculture indicate that this dust explosion is one of the worst, if not the most disastrous, that has ever occurred anywhere since combustible dusts have been known as a cause of explosions.

The Bureau of Chemistry has been conducting special researches to establish the causes of many explosions in industrial plants under a special appropriation of Congress for the purpose. Explosions of this nature may occur in practically all lines of manufacture where combustible dusts are produced during manufacturing or handling and have caused great losses of life and property in recent years. A few years ago an explosion in another starch factory at Cedar Rapids, Ia., resulted in the death of forty-three employees and property damage of several million dollars.

War Department to Push Sale of Remaining Surplus Property

Announcement has been made by the War Department that, beginning at once, every effort will be made to clean up the remaining war surplus property before the close of the fiscal year, which ends June 30.

The first sale of importance is to be held in Boston, Mass., Jan. 17, followed in February and March with sales at army depots in Brooklyn, Chicago, San Francisco and San Antonio. These sales will be Quartermaster auctions and for the major part consist of textiles and general merchandise. Sales of an entirely different character are to be held shortly, when certain large real estate and manufacturing plant holdings located in the United States and Canada will be sold. During the past year the question of disposing of the remaining surplus in two or three large block sales to the highest bidders and winding up the War Department's liquidation activities at the earliest possible date has been under consideration. This idea has been dismissed, however, as having too injurious probabilities in its effect on American industry and trade.

Jones Succeeds Sherrick in Gas Laboratory

G. W. Jones, assistant gas chemist of the Bureau of Mines, has been promoted to associate chemical technologist to fill the vacancy created by the resignation of Dr. J. L. Sherrick, who has gone into private business at 4701 Liberty Ave., Pittsburgh, Pa., in the manufacture of certain gelatin-glue products. Mr. Jones will conduct research on the products of combustion and detonation of explosives, with special reference to the formation of poisonous gases contaminating the atmosphere of mines and tunnels.

W. P. Yant, first assistant in the gas laboratory, succeeds Mr. Jones. Both have been engaged on analyses and research pertaining to mine and industrial gases, and are the authors of a number of papers on this subject.

Mexico Offers Good Glass Market

There is no sheet glass manufactured in Mexico in quantities of commercial importance, but there is a good market for it under normal conditions, Consul General Claude I. Dawson of the State Department reports. The use of plate glass in store windows is very general in all the larger cities and there is the conventional demand for glass windows in all houses in the higher altitudes.

The United States stands second in the exportation of glass to Mexico; Belgium holds first place. The market itself may be considered a free market. Most of the hardware importers handle glass and it is believed they are governed by quality, prices, terms and packing. Packing is a very important consideration, more particularly since the duty on glass is upon a gross weight basis, and the importer must pay duty upon the crating and excelsior. For this same reason his loss from breakage is correspondingly heavier, as he cannot recover duties paid upon damaged goods, nor is he permitted to open his goods and examine them for breakage before paying the duties.

The only important glass factory in Mexico is the Vidriera Monterey, at Monterey. This factory at present confines its production to bottles. Formerly it made only beer bottles, but about a year ago it increased its capacity and began the manufacture of prescription bottles. This is a Mexican concern, but the technical men employed in the factory are all Americans.

Daugherty Condemns Sharing Data Gathered by Trade Associations

Holds Illegal a Practice Believed by Secretary Hoover of Importance to Department of Commerce

THE desire of Secretary Hoover that trade organizations be allowed to gather production and allied statistics and to distribute them among members, provided that they also be made public, has apparently been overruled by Attorney-General Daugherty. The Secretary's request for a ruling and Daugherty's decision came as a result of the decree entered Nov. 26 in the District Court of the United States for the Southern District of Ohio in the case of the United States against the Tile Manufacturers' Credit Association.

The court held that the defendants were not restrained from maintaining an association, either voluntary or incorporated, and that such association might receive and compile for transmission to any government agency information and statistics as to production, shipments, stocks on hand and prices. But the association was restrained by the court from distributing the information among its members.

Hoover Desires Ruling

"It is not the desire or purpose of this department," Secretary Hoover wrote to Mr. Daugherty, "to continue operations under the co-operative plan if it is in conflict with the policy of your department; it is our desire, however, to call your attention to the situation that in my opinion will develop if my interpretation of this decree correctly expresses the policy of your department. I think there is great likelihood that not only the associations from which this department now receives valuable statistics but a great many others will discontinue the collection of information and statistics as to the production, shipments, stock on hand and the prices on closed transactions. They will not go to the expense of collection if the only use that can be lawfully made of them is to transmit them to some governmental department. If this should happen I fear that the efficiency of this department in carrying out the purposes set forth in the act creating it would be very greatly impaired.

"I respectfully request that you informally advise me, in view of the foregoing, whether or not this department should discontinue its present plan of co-operation with trade associations."

Replying to the letter of Secretary Hoover, Attorney-General Daugherty says in part:

"Those who organize and conduct these associations appear to entertain the idea that if the information imparted relates only to past and closed transactions there can be no violation of the anti-trust act. In my judgment such an idea is wholly fallacious. One's future conduct is to be judged by what he has done and is then doing, and not so much by what he says he will do. It is one's actual conduct that is taken as an example for imitation. It has developed in the trial of cases involving associations that the members first agreed upon prices; but such a plan did not work, because the members could not be relied upon to keep the agreement; and the system of exchanging statistics was adopted because it was found to be the only effective way to procure co-operation as to prices and production; and such co-operation could be thus procured even in the absence of any positive agreement.

Daugherty Explains Stand

"Again, the idea seems to be prevalent that no exchange of information between the members, regardless of its extent or character, can be unlawful if at the same time publicity be given thereto through the press or some governmental agency. In my judgment this idea is likewise fallacious. The illegality as well as the evil results arise from the co-operation among the members pursuant to a positive or tacit understanding; and this co-operation is not affected by publicity. Those who purchase the commodity, though fully informed as to the activities of the association, can protect themselves only by an organization and co-operation of like character, which, if it were lawful, is an impossibility upon the part of the public.

"I have no doubt that it is important that those engaged in an industry have general information as to the conditions of that industry, but I think that information should be distributed strictly through a responsible medium, like your department; and I see no objection to its being gathered by an association provided it be strictly guarded and the association be prohibited from distributing it among its membership. This is the same view that I entertained when the communications were exchanged in February, 1922; and it has since been strongly confirmed by decisions of the Supreme Court and by investigations of a number of associations and the trial of cases involving associations."

When asked for an expression of opinion as to the correspondence between Secretary Hoover and Attorney-General Daugherty, Judge Nathan B. Williams, associate counsel of the National Association of Manufacturers, said:

"It is sincerely to be regretted that on a question of vital public policy, interesting alike to the business community and all who buy or consume the products of our industry, the Secretary of Commerce and the Attorney-General of the United States engage in 'informal' letter writing. This extensive correspondence makes slight if any contribution to the clarification of the law concerning the statistical activities of trade associations.

"Apparently, legitimate trade associations will continue their statistical and other activities without reference to this 'informal' correspondence; they will not transgress the well-known inhibitions of existing law, in that they will not misuse their statistical or other trade information in promotion or furtherance of any agreement or conspiracy to fix prices, limit production, restrict sales, divide territory or otherwise restrain lawful competition in commerce; and it appears likely that they will decline to supply any of such information to any department of the government except that which may be called for by statute under the provisions of the laws providing for the taking of the decennial and other censuses."

Combustion Engineering Corp. Wins Patent Dispute

The International Combustion Engineering Corporation has won its claims of priority in patenting certain basic principles of pulverized fuel combustion, according to a decision recently rendered by the U. S. Patent Office. Many claims were involved in an interference between the patent applications of this corporation and those owned by others.

Pulverized fuel combustion has made possible considerable economies in fuel and labor cost during the past few years—so great that the use of this fuel is now one of the outstanding factors in the field of combustion engineering. It is being used in great central and superpower stations, such as the new Ford plant at River Rouge and the new Detroit Edison plant.

The International Combustion Engineering Corporation early took the lead in the business of manufacturing apparatus for burning pulverized fuel. Its apparatus has been installed in most of the great central power stations, and it is the apparatus of the Combustion company that is being sought by European industries, which are realizing the value of this American development.

A combination between International Combustion and Vickers, Ltd., the leading engineering concern of Great Britain, was recently announced, and it is known that important industrial groups in France and Germany have been negotiating with Combustion for purpose of establishing the new industry in those European countries.

Corn Products Opens New Plant in Kansas City

The Corn Products plant at North Kansas City, Mo., is assembling a chemical staff preliminary to starting operations. This plant, which uses 25,000 bu. corn a day when operating, has been closed for several months.

S O S Sent for "Chem. & Met."

The technical literature of the Japanese Institute of Electrical Engineers was entirely destroyed in the disaster that swept Tokyo early in September. Among other files lost was that of *Chem. & Met.*

A letter has been received from the secretary of the society requesting back issues either separately or bound, that the files may be restored. Unfortunately the publishers do not have these on hand.

Any readers who may possess or have knowledge of back numbers which might be contributed to this society have an unusual opportunity to perform a service that would be highly appreciated. The editors of *Chem. & Met.* will be glad to put any readers interested in touch with the society or will forward any copies donated directly, should they be sent to this office.

Higher Freight Rates on Soda Nitrate Not Justified

Proposed increases in the commodity rates on nitrate of soda from New Orleans, Mobile, Gulfport and Pensacola to Central Freight Association destinations are not justified, the Interstate Commerce Commission has ruled. The carriers proposed a much higher schedule of rates on nitrate of soda. The Armour Fertilizer Works and Swift & Co. contended that there is no warrant for singling out nitrate of soda and eliminating it from the list of articles taking fertilizer rates. They pointed out that this commodity long has been included in the fertilizer list in Southern classification and in tariffs naming rates from New Orleans to various points. They called attention to the fact that nitrate is shipped in bags and is transported in equipment of the same character as that in which other recognized fertilizers are transported. In the matter of value, it was pointed out that sulphate of ammonia takes the same rate, but its value usually is materially higher than that of nitrate of soda. The same is true of dried blood, hoof meal and packing house tankage. While the price of sulphate of potash, muriate of potash and cottonseed meal usually ranges somewhat less than nitrate of soda, the same rates are applied to those commodities. The commission upheld the contention.

Helium Plant Pleases

Bureau of Mines officials are enthusiastic over the results of the trial runs of their semi-commercial helium plant at Fort Worth. One of the surprises of the tests was the fact that the plant developed a dependable output at three times its rated capacity. The preliminary runs are regarded as having been completely successful.

Agitation Continues for Removal of Duty on Calcium Arsenate

Sentiment for Tariff Change Contrary to Views of Government Specialists—Import Shipments Last Year Condemned

AGITATION for the removal of calcium arsenate from the dutiable list continues. This is in spite of the consensus of opinion among the government specialists who have been dealing with that commodity. They are unanimous in their expressions, made in reply to requests from various members of the Senate and of the House of Representatives, that more harm than good would be done by removing the duty.

There is practical agreement among the technical men who have been working on the calcium arsenate problem that it should have been put on the free list when the tariff was written. In 1923 there were only three small importations of this material. Two of these shipments were condemned by the Board of Insecticides and Fungicides because of their poor quality. Since the price of calcium arsenate has been high for several years, it is apparent that foreign manufacturers would have taken advantage of this market long since had it not been impracticable to ship the manufactured product. There is no reason to believe that there would be any shipments of calcium arsenate were the duty removed. It is obvious that it would not be sensible to ship an inert material which constitutes 60 per cent of the combination, particularly when the process of combining the two ingredients is a comparatively simple one.

Because of the instability of the arsenic situation and the strong tendency for manufacturers and others engaged in the industry to be frightened by even vague and ridiculous rumors, to say nothing of facts, the removal of the tariff on calcium arsenate would be just one more thing to add to instability. It is feared that any change in the tariff at this time would simply increase the shortage. While no complete survey has been made of the foreign manufacturing situation, there is every reason to believe that no calcium arsenate would be shipped as such even were foreign countries as well equipped to make calcium arsenate as is the United States.

These same authorities believe the most constructive step that can be taken is to set up machinery that will enable the manufacturers of calcium arsenate and the producers of white arsenic to estimate in advance what the demand will be. Another step that would be very helpful, it is pointed out, is the storage of stocks of calcium arsenate at the best points of distribution in the South.

Wilson Entertains Chemists With Leather Story

Addresses New York Society, Giving Light on Many Problems of Manufacture

On Friday evening, Jan. 4, the New York Section of the American Chemical Society was privileged to hear a masterly discussion of the scientific and practical aspects of the chemistry of leather manufacture. The speaker was John Arthur Wilson, chief chemist, A. F. Gallun & Sons, Milwaukee, an outstanding figure in the application of science to the leather industry. It is necessary only to consider the complexity of the raw materials such as collagen or hide substance and the vegetable tannins to realize the fundamental character of the work that must be done to establish theories of practical value.

To begin with, it is essential to understand the complicated skin structure, for each element of this plays an important part in the process of converting the hide into the imputrescible product, leather. Previous work on histology had to be supplemented by special studies of the particular types of hides and skins that are made into leather. Evidence of the enormous progress that has been made was furnished by a series of stained microscope slides. These were projected on the screen and, as explained by Mr. Wilson, made clear the essential elements of skin structure.

Similarly, by means of stained sections, the action of each process to which the hide is subjected as it goes through the tannery was visualized in a remarkably vivid manner. In fact, this series of slides gives in a short time a far better idea of what actually takes place in a tannery than can be gained by a lengthy perusal of many books.

Some recent investigations conducted in Mr. Wilson's laboratories promise to be most helpful in settling the vexing problem of shoe discomfort. It was found that the area of leather undergoes marked change with variation in relative humidity. Other things being equal, the greater the protein content and the greater the acid content of leather the greater will be the increase in area with rising humidity. It happens that vegetable tanned calf contains only about 48 per cent protein and no acid, while the chrome usually contains about 75 per cent protein and 5 per cent combined H_2SO_4 (dry basis). In going from 0 to 100 per cent relative humidity, chrome leather increases more than 18 per cent in area against less than 6 per cent for vegetable. This apparently explains the difference in comfort that has been demonstrated in wearing tests. These have invariably shown the vegetable upper leather to be much more comfortable than chrome.

Commercial Development of Government-Controlled Patents Is Urged

Bills Proposed by Interdepartmental Board Would Also Encourage Inventions by Government Employees

LEGISLATION whereby the federal government may license for commercial use thousands of patents that it holds and which is designed to encourage the inventive genius of government employees by providing compensation for their discoveries and developments while at the same time providing a means of protecting inventions valuable to the national defense is recommended in the report of the Interdepartmental Patents Board.

The report of the board has been transmitted to Congress by President Coolidge and referred to the patent committees of the House and Senate.

After discussing the present confused situation affecting inventions by employees of the government and disclosing the fact that more than 30,000 patents are held by the federal government without Congressional authority to put any of them into commercial use, the board recommends enactment of two laws to relieve the situation, inclosing with its report suggested bills embodying the ideas of the board as to what these laws should be.

One of the suggested bills would authorize the President to constitute a permanent interdepartmental patents board to be composed of one representative from each department or independent establishment which in his judgment is entitled to representation, the members of the board to serve without additional compensation. This board would act as the sole agency through which all patents and patent rights hereafter would be conveyed to the government, and would control and administer all such patents in behalf of the government.

Would Provide Licenses

The board, under this bill, would have authority to issue non-exclusive licenses under patents owned by the United States Government to such individuals, firms or corporations and on such terms as may be in the public interest, all moneys received from such licenses to be converted into the Treasury as miscellaneous receipts.

It would be made the duty of all federal government employees to register with the board all applications for patents they may make on any invention, discovery or development during the period of their employment in the government service. This bill would make an expressed part of the terms of the employment of any government employee that any patent application made or granted because of any invention, discovery or development during his government employment and incident to the line of his official duties which, in the judgment of the board, in the interest of national defense or otherwise in the public interest should be controlled by the government shall be assigned by such employee to the government. This proposed bill would provide an annual appropriation of $25,000 to defray clerical and other expenses of the board.

The second bill suggested by the board is an act to authorize the issuance and withholding and secrecy of patents essential to the national defense. It would authorize the President, or an agency designated by him, whenever the publication of a patent would be prejudicial to the national defense, to order the patent sealed and kept in a secret file. The patent would be forfeited if published in violation of secrecy or if an application for a patent were filed in any other country without consent of the President or his agency. It would provide that upon failure of the patentee to agree with the President or his designated agency as to reasonable compensation, the patentee would have the right to sue the government in the Court of Claims, the proceedings, if requested by the government, to be secret.

The present confusion over the rights of government employees in inventions discovered or developed during their employment has resulted in great loss of inventive genius, the report asserts.

Inventive Genius Now Discouraged

"Many technical ideas that arise during the scientific work of the government bureaus might be developed into valuable inventions, but are now lost because of the want of a proper patent policy clearly defining the inventor's status and thus removing obstacles to the full development of his talent," reads the report. "Many inventions that do take tangible form merely find place in technical publications and are developed no further toward useful application."

Public dedication of patents is opposed by the board as removing the incentive to make the heavy investment which often is necessary to development of the ideas.

The report divides patents of government employees into four classes: 1. Those for national defense which in the public interest should be kept secret. 2. Inventions developed in a bureau's field of work in which the public interest is paramount and would be best protected by government control. 3. Those of such nature that the government desires merely a shop interest or implied license. 4. Those in which the government is not primarily interested and which are mainly for use in industry and which require commercial development with adequate protection to make them effective.

It is recommended that government employees making inventions in classes 3 and 4 be allowed to patent them and exercise the right of control and that the government retain control of those within classes 1 and 2. This would be worked out under the registration system proposed in the suggested bill for a permanent patents board. Compensation would be provided, it is evident from the suggested bill, for inventions within class 1, and probably for some within class 2. The reward for those within classes 3 and 4 would be a commercial transaction entirely.

Government Owns 30,000 Patents

The report points out that the government now holds more than 30,000 patents, many of which are prevented from becoming valuable because of lack of authority to make them available for public use. Many requests for the use of government patents have been received, only to be necessarily refused, it is asserted.

Many of the suits now pending against the government for patent infringements are based upon the use of inventions developed in the government service and not protected by patent or otherwise, in many instances because of a desire to keep the patent secret, the report states. It is estimated that the amount involved in such suits is approximately one billion dollars. The present lack of policy as to patents of government employees is causing many men of ability to resign from the service, the report adds.

The report is unanimous among the members of the Interdepartmental Patents Board, which was created by executive order August 9, 1922. The board included representatives of the Departments of War, Navy, Commerce, Agriculture and Interior. Dr. Andrew Stewart, of the Bureau of Mines, was chairman.

Taylor Society to Discuss Growth

The development and influence of scientific management during the past decade is the central theme around which the next meeting of the Taylor Society is to be built. This meeting is scheduled Jan. 24 to 26, at the Engineering Societies building, New York. Several prominent speakers, authorities on various phases of management, are to speak. The list includes H. P. Kendall, Henry H. Farquhar, John H. Williams, William S. Groom, Stuart Cowan, Mary Gilson, Morris L. Cooke, Frank B. and Lillian M. Gilbreth.

Larkin Endows U. of B.

Walter Platt Cooke, chairman of the council, University of Buffalo, announced on Dec. 31 the gift to the university of $50,000 from John D. Larkin, interested in the Larkin Co. and other business enterprises, bringing the total gifts of Mr. and Mrs. John D. Larkin to the endowment fund to $150,000. This is to be known as the John D. Larkin and Frances H. Larkin Foundation, the income from which will be devoted to the development of the chemistry department of the University of Buffalo.

Market Conditions

Firmer Prices Rule in Market for Chemicals and Allied Products

Upward Revisions Made in Selling Schedules for Several Commodities —Consuming Trades Show More Interest in Contract Deliveries

VARIOUS consuming trades are showing more interest in their requirements for raw materials and demand for chemicals has felt this improvement through a larger call for contract deliveries and also in inquiry for fresh commitments. The textile trade is very spotted, with activity reported in some centers and reduced plant operations in other sections. Soap makers are facing excellent prospects and consumption of materials in that industry in the first quarter of the year promises to be large. Rubber tire production in the Akron district is reported as approximately 95,000 tires a day in comparison with 72,000 tires a day in the early part of last month.

Prices have responded to the better feeling among traders and several important materials have been moved up in value. Among the materials on which higher selling prices have been established are bleaching powder and liquid chlorine. The fact that values are firmer foretells the end of the price-cutting tactics which were common in the past few months and the reason for the upward swing of prices is found in a natural reaction from the unusually low level reached by selling pressure. The weighted index number for the week is 165.74, which compares with 164.43 for the preceding week. The number was influenced not only by firmness in chemicals but also by higher prices for important allied materials.

Receipts of imported chemicals at the local port were smaller during the week, but the position of most chemicals of foreign make was changed but little. Arrivals of Japanese arsenic brought out low-priced offerings ex-dock and showed demand for that product had to be stimulated by price concessions.

Acids

A little better inquiry was reported for mineral acids. Different industries are taking sulphuric and the market is holding a fairly steady position. Producing costs help to hold quotations for nitric but trading is not heavy. Muriatic is also rather quiet and none too steady in price.

Formic acid is reported to be firmer abroad and spot holdings also have been stronger. Offerings of imported are reduced in volume and it is expected that the differential between prices for imported and domestic will narrow. Citric and tartaric are quiet but recent prices have been very low and this precludes much chance for further declines. Oxalic is moving steadily but mainly in small parcels and in the absence of large orders it is difficult to establish the strength of the market.

Production figures for November indicate a gain in output of acetate of lime and stocks of the latter also are large. This has had no bearing on selling prices and acetic acid is holding steady in conformity with the raw material. Glacial acetic still shows a range in price according to seller as imported grades are offered under the asking prices of domestic makers. The lower grades are less subject to competition.

Bleaching Powder and Liquid Chlorine Advance—Carbonate and Sulphate of Lead Higher —Formaldehyde Strengthens —Arsenic Sells Lower on Spot — Domestic Makers Reduce Permanganate of Potash — Caustic Potash Easy—Alkalis Firm—Prussiates Quiet.

Potashes

Bichromate of Potash—Some inquiry for export was reported and domestic buyers while not active were more interested in the market. In some quarters there is more of a tendency to widen the price range according to quantity. The inside price remains at 9½c. per lb., but up to 10c. per lb. is quoted for small lots.

Caustic Potash—No large buying developed during the period and the tone of the market is easy. Spot offerings are generally quoted at 6½c. per lb., but it is possible this might be shaded on a firm bid. Shipments from abroad are still offered at 6¼c. per lb.

Permanganate of Potash—A western producer has announced that, in view of present offerings by importers at low prices, he will protect his customers by supplying them with permanganate at 14c. per lb. in 500 lb. drums, inclusive, and 14¾c. per lb. in 100 lb. drums, inclusive. These prices are f.o.b. producing point in the Middle West, freight equalized with New York City. Imported material, on the other hand, was firmer in the latter part of the week and holders who had been offering spot material at 14c. per lb. refused to sell at that figure and asking prices ranged from 14¾c. to 15c. per lb.

Prussiate of Potash—Red prussiate is quiet and with different sellers in possession of stocks, values are irregular. Quoted prices range from 44c. to 45c. per lb. according to seller. Yellow prussiate appeared to be a little steadier as most sellers were asking 22c. per lb. for spot material. On shipments from foreign points it was possible to do 20c. per lb.

Sodas

Acetate of Soda—While no change in price has been made, the market is said to be working into a better position. In the first place, resale lots are not prominent and producers are in control. Production has not been large and this has prevented heavy accumulations at works. Buying has not yet opened up and quotations are repeated at 5@5¼c. per lb. at works.

Carbonate of Soda — Regular deliveries are going forward against contracts and the market retains the steady appearance which has characterized it for months. Market prices are $1.75 per 100 lb. in bulk; $2 per 100 lb. in bbl., and $2.25 per 100 lb. in kegs, f.o.b. works. Spot material is held at $2.25 per 100 lb. in bbl., and $2.50 per 100 lb. in kegs.

Bichromate of Soda—Some producers are reported to be carrying small stocks and the undertone in general is firm. The range in quotations is kept at 7¼@7¾c. per lb. but the inside figure is difficult to negotiate and on good sized lots 7½c. per lb. is the best some sellers will do. Call for January deliveries is heard and new business is gaining in volume. No change in chrome ore.

Caustic Soda—It is stated that, with the exception of Pacific coast points, prices for jobbing lots are now on a uniform level. This is in contrast to conditions in the latter part of last year, when the market was disturbed by reports of price cutting. On round lots, the contract price is steady at 3.10c. per lb., carlots, at works. For export, the price is 3.10c. per lb. f.a.s. New York. Good export business is said to have been placed in the first week of the year.

Chlorate of Soda—Under quiet demand the market retains an easy position. Imported grades are offered in the spot market at 6¼@6½c. per lb. Buying is confined to small amounts

with large consumers apparently covered for the present.

Nitrate of Soda—Viewed from the standpoint of producers, the nitrate movement is encouraging. This is shown by reports that sales for the nitrate year which will end with June, 1924, are larger than for the preceding nitrate year. Buying orders at present are slow, as neither this country nor Europe is in the market. Stocks in this country are in firm hands. Resale material is not a factor and values are firm in sympathy with the position at primary points. A quotation of $2.50 per 100 lb. is heard but is largely nominal.

Prussiate of Soda—It is difficult to hold this material on a steady basis. Buyers are not operating and some sellers are willing to shade quotations in order to stimulate trading. The general asking price on spot is 11¾c. per lb. but on desirable business 11c. per lb. can be done. On shipments foreign prussiate is offered at 11c. per lb.

Miscellaneous Chemicals

Acetate of Lime—Figures for production of acetate of lime in November show an output of 14,357,614 lb. with shipments of 13,771,472 lb. Both totals are below those for the corresponding period of 1922. There has been no change in market conditions and leading sellers hold quotations at $4 per 100 lb.

Acetate of Lead—Firmness in the metal has brought upward revisions in quotations for some of the lead products but acetate of lead while firmly held was unchanged although some factors in the trade look for a rise in values if the advance in the metal is sustained. Current quotations are 14@14½c. per lb. for white crystals, and 13@13½c. per lb. for brown, broken.

Arsenic—Imports of Japanese arsenic reached the market during the week and were pressed for sale. Holders were obliged to give concessions in order to move the goods and sales were made at 12½c. per lb. ex-dock. Some reports credit sales under 12½c. per lb., but it is substantiated that some of these goods changed hands at that figure. At the close of the period, the market was free from this pressure and 13c. per lb. was given as the inside figure of sellers. Calcium arsenate is moving slowly and prices are easy. Goods at eastern points are subject to bids and 11½c. per lb. can be done without difficulty.

Barium Products—The market was quiet for most barium products. Carbonate was on the market at $66 per ton. Chloride was held at $84 per ton on spot with shipments from abroad offered at $80 per ton.

Bleaching Powder—Effective Jan. 5 prices for bleaching powder were advanced to a basis of $1.50 per 100 lb. in standard drums, f.o.b. works. The quotation for small drums was placed at $1.75 per 100 lb. f.o.b. works. These prices hold good for contracts and for spot transactions and apply to carlot orders. For less than carlots quotations are 15c. per 100 lb. above these figures. The recovery in prices is regarded as an indication that selling competition is less keen and as former prices were said to be too low to admit of producing at a profit, it was inevitable that a rise in quotations would follow as soon as selling pressure was removed.

Liquid Chlorine—Following the lead of bleaching powder, liquid chlorine has moved up in price. The revised quotations are: $3.50 per 100 lb. in tank car lots f.o.b. works; $4.50 per 100 lb. in cylinders, carlots, at works; $5 per 100 lb. on sales of more than 1 ton f.o.b. works; $6 per 100 lb. on sales of 1 ton or less f.o.b. works. The new schedule is for spot sales and for contracts.

"Chem. & Met." Weighted Index of Chemical Prices

Base = 100 for 1913-14

This week	**165.74**
Last week	164.43
Jan., 1923	174.00
Jan., 1922	147.00
Jan., 1921	181.00
Jan., 1920	242.00
Jan., 1919	262.00
Jan., 1918	281.00

There was an advance in the week's index number of 131 points, reflecting higher prices for bleaching powder, chlorine, formaldehyde, linseed oil and crude cottonseed oil.

Formaldehyde—A firmer tone was noted in the market and leading factors in the trade have advanced their price to 10¾c. per lb. Bids at 10½c. per lb. were refused and the market appears to be well established at the higher level. Resale lots have been cleaned up and competition has been lessened.

Ethyl Acetate—This material is firmly held at the recent advance. Consumers are taking regular deliveries and consuming requirements are reported to be on a par with present production. Current quotations for the 85 per cent are $1.05 per gal. for tank car lots and $1.07 per gal. in drums. For 99 per cent sellers ask $1.20 per gal. in tank cars and $1.22 per gal in drums.

Coal-Tar Products

More Buying Interest in Benzene—Refined Naphthalene Firmer—Phenol on Spot Scarce—Aniline Oil Steady

WHILE there was some improvement in the demand for benzene, supplies were sufficient for current needs and prices did not respond to the increase in business. Some of the larger producers, however, reported reduced holdings and regarded the market as steady. Trading in odd lots by outside producers at slight concessions failed to shake the confidence of traders. The recent uplift in crude petroleum was accepted as proof that the gasoline situation would soon right itself, which, in turn, should bring about better trading conditions in the market for the coal-tar product. There was a firmer feeling to the market for refined naphthalene and in several directions slightly higher prices prevailed.

The spot market for phenol was wholly nominal. Prices named ranged from 29c. to 37c. per lb., depending upon the seller and quantity. On contract the nominal quotation of 26c. was repeated, but leading producers are well sold up. Cresylic acid was irregular on keen competition for business.

Steady prices were reported for aniline oil, but first hands look for no immediate change in the selling schedule. Pyridine was offered more freely, especially for shipment from abroad. Xylene was easier on increased holdings.

Aniline Oil and Salt—Fair business was put through in aniline oil on the basis of 16c. per lb., carload lots, drums extra. The market presented a firm appearance and on small lots holders would not do better than 16½@17c. per lb. Aniline oil for red was unchanged at 40@43c. per lb. Aniline salt was steady at 22@23c. per lb.

Benzene—Leading interests offered 90 per cent material at 21c. per gal., tank cars, works, but in outside quarters scattered lots sold at concessions. Recent business went through as low as 19c. per gal. Demand was better and the undertone was more in favor of sellers. Moderate export call was in evidence.

Beta Naphthol—There were offerings on spot at 24c. per lb., indicating that the market was no longer firm. Demand was described as routine only.

Dimethylaniline—The market was unsettled, quotations ranging from 38@40c. per lb., with a possibility of shading the inside figure on a round lot.

Naphthalene—A firmer undertone featured the market for refined material and several operators were disposed to ask higher prices. In fact the range on flake for shipment at the close stood at 6@6½c. per lb., the inside figure obtaining on carload lots. Ball closed nominally at 7@7½c. per lb. Chips were unchanged at 5@5½c. per lb., carload basis. The foreign markets for crude showed no important change for the week.

Paranitraniline — The market was barely steady at 70@73c. per lb. Offerings were liberal and on scattered lots in outside hands prices could have been shaded.

Phenol—One distributor has raised the market to 29c. per lb., in drums, but had nothing to offer except to regular trade. In the outside market small lots changed hands at 35@37c. per lb., in drums, immediate delivery. On contract the nominal quotation stood at 26c. per lb., with little offering. Demand was fair.

Vegetable Oils and Fats

Active Trading in Coconut and Palm—Crude Cottonseed Higher—Linseed Futures Up—Tallow Strong

FAIRLY active trading in coconut oil was the feature in the market. Further business was put over in tallow, soap makers closing for liberal quantities at higher prices. The uplift in tallow stimulated buying interest in the palm oil group and closing prices showed a higher range. Crude cottonseed sold at higher prices in the Southeast as well as in Texas. Linseed oil was firmer on the recent advance in seed.

Cottonseed Oil—Offerings were light, and, on support in nearby oil from refining interests, the market advanced to the extent of ¼c. per lb. Crude oil sold at 9⅜c. per lb., tanks, f.o.b. mills, Southeast, and at 9⅛c. per lb., tanks f.o.b. mills, Texas. Cash business in refined oil was fair, while compound sales were up to normal for this season of the year. On compound the market held at 13@13½c. per lb., carload basis. Spot prime summer yellow, in bbl., was nominal at 11¾@12¼c. per lb., according to quantity and seller. The amount of cotton ginned prior to Jan. 1 totaled 9,807,138 running bales, according to the Bureau of Census, compared with 9,597,330 running bales to Jan. 1 a year ago. The figures were slightly better than what traders expected and tend to confirm the official estimate on the crop.

Linseed Oil—Trading was moderate in volume, but prices ruled firm, especially in the more forward positions. Early in the week several tank cars of oil sold for April delivery at 77c. per gal., equal to 83c. per gal. in cooperage. February-March oil sold later at 89c. per gal., cooperage basis. Prompt shipment oil settled at 91c., which compares with 90c. a week ago. At the close February-March stood at 89c. and April forward at 85c. per gal., cooperage basis. During the week the first official Indian estimate on area sown to flaxseed reached New York and based on plantings of 2,575,000 acres the crop is estimated at 22,000,000 bu., or slightly more than the 1922-23 total. The condition of the crop is fair, some sections reporting insufficient moisture. Shipments from the last Indian crop amounted to approximately 13,500,000 bu., of which total the United Kingdom received 7,500,000 bu., and the Continent 6,000,000 bu. Argentine prices stiffened on buying for American crushers. February-March Argentine seed sold at $1.87@$1.88 per bu., c.i.f. New York. Duluth seed prices ruled steady on light offerings, stocks in the Northwestern markets being in firm hands.

China Wood Oil—The Orient reported firm prices, but the market here was unsettled. One parcel of 300 bbl. sold at 20⅝c. per lb., in bbl., delivered to a consumer in Brooklyn, N. Y. On the Pacific coast prompt oil sold at 19¾c. per lb., tank car basis.

Coconut Oil—A leading soaper took on 150 tanks of Ceylon type oil for shipment from the Pacific coast at 8⅛@8¼c. per lb., the inside figure obtaining on nearby material. This trading steadied prices and at the close 8⅜c. represented the market on the coast and 8⅝c. in New York, tank cars, f.o.b.

Corn Oil—Demand was good and last sales went through at 10c., tank cars, Chicago.

Olive Oil Foots—Firm prices prevailed, the market holding at 9½c. c.i.f. New York.

Palm Oils—Several round lots of Lagos oil sold at 8c. per lb., while Niger brought 7@7.15c. per lb., the high figure prevailing late in the week. Offerings were smaller and the market was strong in sympathy with tallow.

Other Vegetable Oils — Refined sesame oil for February-March shipment from abroad advanced to 12.01c. per lb., c.i.f. New York. Crude sesame offered for shipment at 10.75c. per lb. Soya bean for prompt shipment from Orient, bulk basis, in bond, offered at 7.25c. c.i.f. coast. Soya in tanks, duty paid, coast, 10c. per lb. Refined rapeseed for shipment from abroad nominal at 79c. per gal.

Tallow, etc.—Sales of extra special at 8½c., an advance of ¼c. Market strong. Yellow grease advanced to 7¼@7½c. per lb. Oleo stearine sold at 10c. per lb., decline of ¼c. No. 1 oleo oil nominal at 16c. per lb., in bbl.

Indian Flaxseed Production

The area sown to flaxseed in India for the 1923-24 season is placed at 2,575,000 acres and the yield, according to preliminary estimates, will be 22,000,000 bu., or slightly more than in the preceding crop year.

Production of flaxseed in India for the past 10 years, in bu., follows:

1924	*22,000,000
1923	21,280,000
1922	17,360,000
1921	10,800,000
1920	16,760,000
1919	9,400,000
1918	20,600,000
1917	21,040,000
1916	19,040,000
1915	15,880,000

*Preliminary forecast.

Miscellaneous Materials

Antimony — Slightly higher prices prevailed toward the close, the market for Chinese settling at 10@10½c. per lb. Cookson's "C" grade was firm at 11⅛@11¼c. per lb. Chinese needle antimony, lump, 6⅞@7½c. per lb., nominal. Standard powdered needle, 200 mesh, 8@9c. per lb. White oxide, Chinese, 8@8½c. per lb.

Barytes—Crude was higher in the West, the nominal quotation at the close being $8.50 per ton, f.o.b. mines. White floated was quotably unchanged at $26@$28 per ton, carload lots, packaged included, f.o.b. St. Louis. Lithopone makers holding off from placing further business for the time being, as stocks of finished material have accumulated.

Glycerine—Sales of dynamite in the West went through at 15c. per lb., carload basis, a decline of ½c. In New York territory prices for dynamite held around 15½@16c. per lb. Chemically pure was nominally unchanged at 16½@17c. per lb., as to quantity and seller. Soap lye crude, basis 80 per cent, loose, was offered at 10½c. per lb., f.o.b. point of production. Saponification, basis 88 per cent, settled nominally at 11¾@12c. per lb.

Naval Stores—An advance of 12c. per gal. was reported in spirits of turpentine. The uplift was caused by improved buying in the different primary markets. The advance stimulated business in the local trade to some extent. Rosins were higher on better demand from soap makers, the various grades closing from 20 to 40c. per bbl. higher.

Shellac — Foreign markets came in slightly higher and with less pressure on spot the undertone toward the close, was quite steady. T. N. held firm at 60@61c. per lb., most traders asking the outside figure. Bleached bonedry was in better demand and prices closed nominally at 72@73c. per lb.

White Lead, etc.—Corroders advanced prices on all of the lead pigments ¼c. per lb. The advance was expected in view of the recent uplift in prices for pig lead. Demand was described as normal. Standard dry white lead, basic carbonate, is now held at 9½c. per lb., with the sulphate, both white and blue, at 9c. per lb. Red lead, dry, was revised to 11.15c. per lb. Litharge closed at 10.65c., with orange mineral at 15¼c. per lb., in casks.

Alcohol

Demand for denatured alcohol was good last week and this strengthened the market in all quarters. However, the prices named showed no change. The cold spell stimulated business in anti-freezing material. No. 5 completely denatured sold on the basis of 44½c. per gal., carload lots, drums extra. The market for U.S.P. ethyl spirits held at $4.78 per gal., cooperage included. There was no change in the position of methanol, offerings being plentiful and prices barely steady. On the 95 per cent grade first hands quote 93c. per gal., in bbl., carload lots. Pure, in tanks, was unchanged at 90c. per gal. Production of methanol in November is estimated at 739,497 gal.

Financial Notes

A special meeting will be held at Guttenburg, N. J., on Jan. 24, to take final steps in the reorganization plan of the American Cotton Oil Co.

The Congoleum Co. has declared an initial quarterly dividend of 75c. on the common, payable Jan. 30 to stock of record Jan. 15. This places the new stock on a $3 annual basis.

The Continental Can Co. has declared a dividend of 5 per cent in common stock on the common stock and regular quarterly cash dividend of $1, both payable Feb. 15 to stock of record Feb. 5.

Directors of Ray Consolidated Copper Co. have voted to offer 1,500,000 shares of the Ray company stock for the property of Chino Copper Co., and meetings of stockholders of both companies have been called for Feb. 15 to ratify the proposed consolidation, which will require increase in Ray's capital stock of 1,500,000 shares.

Stockholders of V. Vivaudou, Inc., at special meeting approved increase in common stock from 300,000 to 340,000 shares and at the same time authorized an issue of $1,000,000 7 per cent convertible preferred.

Latest Quotations on Industrial Stocks

	Last Week	This Week
Air Reduction	67½	71¾
Allied Chem. & Dye	70½	73
Allied Chem. & Dye pfd	111¼	110¾
Am. Ag. Chem	16	16½
Am. Ag. Chem. pfd	46½	47
American Cotton Oil c'f's	11¼	12
American Cyanamid	*86	*86
Am. Drug Synd	5¼	5⅞
Am. Linseed Co	19	20¼
Am. Linseed pfd	37⅞	38¾
Am. Smelting & Refining Co	60⅞	60½
Am. Smelting & Refining pfd	96	97½
Archer-Daniels Mid. Co. w.i.	27	28
Archer-Daniels Mid. Co. pfd	90	91
Atlas Powder	54	53
Casein Co. of Am	*66	*66
Certain-Teed Products	*30	34½
Commercial Solvents "A"	*40½	42
Corn Products	157	158¾
Corn Products pfd	*122	119
Davison Chem.	67⅞	65
Dow Chem. Co	*47½	*47
Du Pont de Nemours	133¼	131⅝
Du Pont de Nemours db	86	86
Freeport-Texas Sulphur	12½	13
Grasselli Chem.	*125	*125
Grasselli Chem. pfd	*105	*102
Hercules Powder	*110	*108
Hercules Powder pfd	*104	*104
Heyden Chem.	*1½	1⅞
Intn'l Ag. Chem. Co. (new)	4½	4¾
Int'l Ag. Chem. pfd	7⅞	9⅞
Int'l Nickel	13¼	13½
Int'l Nickel pfd	*81	79½
Int'l Salt	*89½	*89½
Mathieson Alkali	40	40
Merck & Co	*65	*60
National Lead	143	143½
National Lead pfd	112¾	113½
New Jersey Zinc	*148	*148
Parke, Davis & Co	*78	*79½
Pennsylvania Salt	*86	*86
Procter & Gamble	*140	*130
Sherwin-Williams	*30	30
Sherwin-Williams pfd.	*100	*101
Tenn. Copper & Chem	9⅞	9⅞
Texas Gulf Sulphur	62½	63¼
Union Carbide	57¾	59⅞
United Drug	82½	81¾
United Dyewood	*40	*43
U. S. Industrial Alcohol	71⅞	71⅞
U. S. Industrial Alcohol pfd	*98	*98
Va.-Car. Chem. Co.	9¾	9¾
Va.-Car. Chem. pfd	34½	33⅞

*Nominal. Other quotations based on last sale.

Imports at Port of New York

January 4 to January 10

ACIDS—Cresylic—23 dr., Liverpool, Order; 12 dr., Glasgow, Order. **Boracic**—250 dble. bg., Leghorn, Pacific Coast Borax Co. **Tartaric**—130 bbl. and 100 keg, Rotterdam, W. Benkert & Co.; 57 csk., Rotterdam, Order.

ALBUMEN—44 csk., Manchester, W. A. Ross & Bros.; 11 cs., Tientsin, Olivier & Co.

ALUMINA HYDRATE—20 csk., Hamburg, A. Hurst & Co.

AMMONIUM CARBONATE—30 csk. and 10 bbl., Liverpool, Brown Bros. & Co.; 20 csk., Liverpool, Brown Bros. & Co.

ANTIMONY REGULUS—500 cs., Hankow, Columbia Bank.

ARSENIC—197 cs., Kobe, Gravely & Co.; 623 cs., Kobe, J. D. Lewis; 500 cs., Kobe, Takata & Co.; 153 cs., Kobe, Frazar & Co.; 500 cs., Kobe, Mitsui & Co.; 400 cs., Osaka, Mitsui & Co.; 247 cs., Kobe, H. Sundheimer, Inc.; 80 cs., Kobe, J. D. Lewis; 500 cs., Kobe, National Shawmut Bank of Boston; 200 cs., Kobe, Order; 300 cs., Osaka, Mitsui & Co.

BARYTES—30 bbl., Hamburg, E. Suter & Co.

BAUXITE—71 tons (bulk) and 28 bg., Paramaribo, A. M. Kohler.

BLEACHING POWDER—75 cs., Liverpool, H. Kohnstamm & Co.

BRONZE POWDER—12 cs., Hamburg, L. Uhlfelder & Co.; 8 cs., Hamburg, Order; 19 cs., Bremen, Bank of Manhattan Co.; 12 cs., Bremen, L. Uhlfelder & Co.; 3 cs., Bremen, Order; 30 cs., Bremen, Baer Bros.

CAMPHOR—150 cs., Keelung, L. C. Hopkins & Co; 168 cs., Keelung, D. L. Moss & Co.; 250 cs., Yokohama, J. L. Hopkins Co.; 250 cs., Yokohama, Tiscoloid Co.; 100 cs., Shanghai, C. Pfizer & Co.

CHALK—1,200 bg. and 200 bbl., Antwerp, Bankers Trust Co.; 250 bg., Antwerp, Order.

CHEMICALS—15 cs., Hamburg, A. V. Berner & Co.; 20 dr., Havre, E. Ritter; 74 bbl., Hamburg, Roessler & Hasslacher Chemical Co.; 93 csk., Hamburg, Order; 48 bbl., Liverpool, Truempy, Faesy & Besthoff; 400 bg., Glasgow, Brown Bros. & Co.; 56 csk., Glasgow, Order.

CITRATE LIME—324 csk., Messina, C. Pfizer & Co.

COAL-TAR DISTILLATE—60 dr., Glasgow, Order.

COLORS—3 bbl. aniline, Hamburg, Carbic Color & Chemical Co.; 1 bbl. do., Hamburg, Order; 13 cs. do., Havre, Irving Bank-Col. Trust Co.; 32 csk. do., Havre, Sandoz Chemical Works; 4 pkg. aniline, Havre, Carbic Color & Chemical Co.; 156 pkg. do., Havre, Ciba Co.; 15 cs. colors, Hamburg, D. Heydemann & Co.; 13 csk. aniline, Rotterdam, Garfield Aniline Works; 23 csk. do., Rotterdam, Carbic Color & Chemical Co.; 21 csk. do., Rotterdam, H. A. Metz & Co.; 24 csk. do., Rotterdam, Bank of the Manhattan Co.; 9 csk. do., Rotterdam, G. A. Kuhl; 104 csk. do., Rotterdam, Kuttroff, Pickhardt & Co.; 27 pkg. do., Rotterdam, Grasselli Chemical Co.; 4 csk. aniline, Antwerp Am. Exchange National Bank; 60 csk. earth, Bremen, Heller & Merz Co.

COPPER SULPHATE—100 cs., Hamburg, Order; 200 csk., Liverpool, Nitrate Agencies Co.

CREAM TARTAR—200 bbl., Algiers, Order; 400 csk., Marseilles, Brown Bros. & Co.

DIVI-DIVI—619 bg., Curacao, Eggers & Heinlein.

EPSOM SALT—240 csk. Hamburg, Order.

FERRO-CHROME — 284 csk., Gothenburg, Charles Hardy, Inc.

GLAUBER SALT—500 bg., Hamburg, E. Suter & Co.

GLYCERINE—60 csk. crude, Marseilles, Order.

GUMS—1,165 cs. copal, Antwerp, Central Union Trust Co.; 300 bg. do., Antwerp, National City Bank; 220 bg. copal, Manila, Chartered Bank of India, Australia & China; 40 bg. copal, Manila, Central Union Trust Co.; 74 pkg. do., Manila, Order.

IRON OXIDE—120 bbl., Malaga, American Exchange National Bank; 184 bbl., Malaga, C. K. Williams & Co.; 29 bbl., Malaga, Smith Chemical Co.; 14 bbl., Malaga, Meteor Products Co.; 99 bbl., Malaga, Reichard-Coulston, Inc.; 108 bbl., Malaga, Order; 100 bbl., Malaga, C. J. Osborn Co.; 69 bbl., Malaga, E. M. & F. Waldo; 250 bbl., Malaga, C. K. Williams & Co.; 34 bbl., Malaga, Reichard-Coulston, Inc.; 16 csk., Liverpool, J. A. McNulty; 5 csk., Liverpool, Hanson & Van Winkle Co.

IRON SULPHATE—48 bbl. green, Liverpool, Order.

LOGWOOD EXTRACT — 20 cs., Havre, Order.

MAGNESITE—220 bbl., Rotterdam, Innis, Speiden & Co.; 125 bg. and 45 bbl., Rotterdam, Speiden, Whitfield Co.

MAGNESIUM SULPHATE — 200 bbl., Hamburg, Hans Hinrichs Chemical Corp.

MINERAL WHITE—200 bg., Naples, V. Celentano.

OILS — China Wood — 285 csk., Hankow, Sin Java Handels'g; 147 csk., Hankow, A. Klipstein & Co.; 302 csk., Hankow, G. W. S. Patterson & Co.; 240 csk., Hankow, Mitsubishi Shoji Kaisha, Ltd.; 150 csk., Hankow, Balfour, Williamson & Co.; 600 bbl., Hankow, Mitsubishi Shoji Kaisha; 196 bbl., Hankow, Mitsui & Co.; 180 csk., Hankow, Paterson, Boardman & Knapp; 310 bbl., Hankow, Suzuki & Co. **Cod**—500 bbl., Glasgow, Order. **Herring**—300 bbl., Kobe, Cook & Swan Co.; 300 bbl., Kobe, Cook & Swan Co. **Linseed**—50 bbl., Rotterdam, J. Lucas & Co. **Olive Foots** (sulphur oil)—500 bbl., Bari, Equitable Trust Co.; 200 bbl., Bari, National City Bank; 150 bbl., Palermo, Order. **Palm**—24 bbl., Antwerp, Oelrichs & Co. **Sesame**—300 bbl., Rotterdam, Order. **Sperm**—30 bbl., Glasgow, Order. **Whale**—62 bbl., Cristobal, Order.

OCHER—259 csk., Marseilles, Reichard, Coulston, Inc.; 121 csk., Marseilles, J. L. Smith & Co.; 175 csk., Marseilles, Am. Exchange National Bank.

POTASSIUM SALTS—10 keg red prussiate, Liverpool, C. Tennant Sons & Co.; 50 csk. yellow prussiate and 4 csk. red prussiate, Liverpool, C. Tennant Sons & Co.

QUEBRACHO—6,156 bg., Buenos Aires, Bank of New York and Trust Co.; 1,020 bg., Buenos Aires, First National Bank of Boston; 1,031 bg., Buenos Aires, Irving Bank-Col. Trust Co.

SHELLAC—63 bg. garnet lac, Hamburg, Kasebier-Chatfield Shellac Co.; 10 cs., Hamburg, Order; 625 bg., Calcutta, Lee, Higginson & Co.; 824 bg., Calcutta, Order; 446 bg. seedlac, Calcutta, Order; 322 bg., Calcutta, First Fed. Foreign Banking Ass'n; 80 bg., Calcutta, Bank of Montreal; 29 bg., Calcutta, Bank of America; 2,124 bg., Calcutta, Order.

SODIUM SALTS—162 csk. nitrite, Hamburg, Kuttroff, Pickhardt & Co.; 231 dr. sulphite, Hamburg, C. S. Grant & Co.; 280 cs. cyanide, Marseilles, Asia Banking Corp.; 203 bbl. chlorate, Barcelona, Irving Bank-Col. Trust Co.

SUMAC—1,400 bg. ground, Palermo, Order; 210 bg., Palermo, Order.

TALC—400 bg., Leghorn, L. A. Salomon & Bros.; 120 bg. Genoa, Order.

TARTAR—84 bg., Southampton, Order; 1,054 bg., Buenos Aires, Tartar Chemical Co.; 755 bg., Marseilles, Tartar Chemical Works; 707 sk., Marseilles, C. Pfizer & Co.; 30 cs. Naples, C. B. Richard & Co.; 41 pkg., Naples, Tartar Chemical Works; 20 csk., Naples, Tartar Chemical Works.

UMBER—65 bbl., Leghorn, E. E. Marks & Co.; 10 csk., Leghorn, P. Uhlich Co.; 10 bg., Leghorn, Reichard-Coulston, Inc.; 43 bbl., Leghorn, Order.

VALONEA—2,520 bg., Dardanelles, Order; 1,565 bg., Smyrna, Order.

VEGETABLE WAX—200 cs., Kobe, National City Bank.

WAXES—200 cs. paraffine, Havre, Lazard Freres; 386 blocks ozokerite, Bremen, Order; 256 bbl. bees, Lisbon, Banco Nacional Ultramarino; 18 bg. bees, Samana, J. J. Julia & Co.; 14 pkg. bees, Puerto Plato, Order; 166 bg. carnauba, Ceara, Strohmeyer & Arpe; 123 bg. do., Ceara, National City Bank; 79 bg. do, Ceara, Order; 10 pkg. bees, Rio de Janeiro, D. Steengrafe; 22 bg. bees, Catania, Order.

WHITING—1,000 bg., Antwerp, Order; 1,250 bg., Antwerp, Order.

WOOL GREASE—60 bbl., Antwerp, Order.

ZINC OXIDE—50 bbl., Marseilles, Order.

Current Prices in the New York Market

For Chemicals, Oils and Allied Products

General Chemicals

Acetone, drums	lb.	$0.25 –	$0.25½
Acetic anhydride, 85%, dr.	lb.	.38 –	....
Acid, acetic, 28%, bbl.	100 lb.	3.38 –	3.63
Acetic, 56%, bbl	100 lb.	6.75 –	7.00
Acetic, 80%, bbl.	100 lb.	9.58 –	9.83
Glacial, 99½%, bbl.	100 lb.	12.00 –	12.78
Boric, bbl.	lb.	.10 –	....
Citric, kegs	lb.	.46½–	.48
Formic, 85%	lb.	.12½–	.13
Gallic, tech.	lb.	.45 –	.50
Hydrofluoric, 52%, carboys	lb.	.11 –	.12
Lactic, 44%, tech., light, bbl.	lb.	.11½–	.12
22% tech., light, bbl.	lb.	.05½–	.06
Muriatic, 18° tanks	100 lb.	.90 –	1.00
Muriatic, 20°, tanks	100 lb.	1.00 –	1.10
Nitric, 36°, carboys	lb.	.04½–	.05
Nitric, 42°, carboys	lb.	.05¼–	.05½
Oleum, 20%, tanks	ton	18.50 –	19.00
Oxalic, crystals, bbl.	lb.	.11¾–	.12½
Phosphoric, 50% carboys	lb.	.07½–	.08½
Pyrogallic, resublimed	lb.	1.50 –	1.60
Sulphuric, 60°, tanks	ton	9.00 –	11.00
Sulphuric, 60°, drums	ton	13.00 –	14.00
Sulphuric, 66°, tanks	ton	15.00 –	16.00
Sulphuric, 66° drums	ton	20.00 –	21.00
Tannic, U.S.P., bbl.	lb.	.65 –	.70
Tannic, tech., bbl.	lb.	.45 –	.50
Tartaric, imp., powd., bbl.	lb.	.26½–	.27
Tartaric, domestic, bbl.	lb.	.30 –	....
Tungstic, per lb.		1.20 –	1.25
Alcohol, butyl, drums, f.o.b. works	lb.	.26 –	.28
Alcohol ethyl (Cologne spirit), bbl.	gal.	4.81 –	....
Ethyl, 190 p'f. U.S.P., bbl.	gal.	4.78 –	....
Alcohol, methyl (see Methanol)			
Alcohol, denatured, 190 proof			
No. 1, special bbl.	gal.	.51½–	...
No. 1, 190 proof, special, dr.	gal.	.45½–	...
No. 1, 188 proof, bbl	gal.	.52½–	...
No. 1, 188 proof, dr	gal.	.48½–	...
No. 5, 188 proof, bbl	gal.	.50½–	...
No. 5, 188 proof, dr	gal.	.44½–	...
Alum, ammonia, lump, bbl.	lb.	.03½–	.04
Potash, lump, bbl.	lb.	.03 –	.03½
Chrome, lump, potash, bbl.	lb.	.05½–	.06
Aluminum sulphate, com., bags	100 lb.	1.40 –	1.50
Iron free bags	lb.	2.40 –	2.50
Aqua ammonia, 26°, drums	lb.	.07 –	.07½
Ammonia, anhydrous, cyl.	lb.	.30 –	.30½
Ammonium carbonate, powd. tech., casks	lb.	.09 –	.09½
Ammonium nitrate, tech., casks	lb.	.09 –	.10
Amyl acetate tech., drums	gal.	4.50 –	4.75
Antimony oxide, white, bbl.	lb.	.08 –	.08½
Arsenic, white, powd., bbl.	lb.	.13 –	.13½
Arsenic, red, powd., kegs	lb.	.15 –	.15½
Barium carbonate, bbl.	ton	66.00 –	68.00
Barium chloride, bbl.	ton	84.00 –	90.00
Barium dioxide, 88%, drums	lb.	.17½–	.18
Barium nitrate, casks	...	.07½–	.08
Blanc fixe, dry, bbl.	lb.	.04 –	.04½
Bleaching powder, f.o.b. wks., drums	100 lb.	1.50 –	....
Spot N. Y. drums	100 lb.	2.00 –	....
Borax, bbl.	lb.	.05½–	.05¾
Bromine, cases	lb.	.28 –	.30
Calcium acetate, bags	100 lb.	4.00 –	4.05
Calcium arsenate, dr.	lb.	.11½–	.12
Calcium carbide, drums	lb.	.05 –	.05½
Calcium chloride, fused, dr. wks.	ton	21.00 –	....
Gran. drums works	ton	27.00 –	....
Calcium phosphate, mono, bbl.	lb.	[illegible]–	.07
Camphor, cases	lb.	.84 –	.85
Carbon bisulphide, drums	lb.	.06 –	.06½
Carbon tetrachloride, drums	lb.	.09 –	.09½
Chalk, precip.—domestic, light, bbl.	lb.	.04½–	.04¾
Domestic, heavy, bbl.	lb.	.03½–	.04
Imported, light, bbl.	lb.	.04½–	.05
Chlorine, liquid, tanks, wks.	lb.	.04 –	.04½
Contract, tanks, wks.	lb.	.03½–	....
Cylinders, 100 lb., wks.	lb.	.05½–	.06
Cylinders, 100 lb., spot	lb.	.08½–	.09
Chloroform, tech., drums	lb.	.30 –	.32
Cobalt, oxide, bbl.	lb.	2.10 –	2.25
Copperas, bulk, f.o.b. wks.	ton	18.00 –	19.00
Copper carbonate, bbl.	lb.	.18 –	.19
Copper cyanide, drums	lb.	.47 –	.50
Coppersulphate, dom., bbl.	100 lb.	4.75 –	4.90
Imp bbl	100 lb.	4.50 –	....
Cream of tartar, bbl.	lb.	.22½–	.25½
Epsom salt, dom., tech., bbl.	100 lb.	1.75 –	2.00
Epsom salt, imp., tech., bags	100 lb.	1.00 –	1.05
Epsom salt, U.S.P., dom., bbl.	100 lb.	2.25 –	2.50
Ether, U.S.P., resale, dr.	lb.	.13 –	.15
Ethyl acetate, 85%, drums.	gal.	1.07 –	....

THESE prices are for the spot market in New York City, but a special effort has been made to report American manufacturers' quotations whenever available. In many cases these are for material f.o.b. works or on a contract basis and these prices are so designated. Quotations on imported stocks are reported when they are of sufficient importance to have a material effect on the market. Prices quoted in these columns apply to large quantities in original packages.

Ethyl acetate, 99%, dr.	gal.	$1.22 –	....
Formaldehyde, 40%, bbl.	lb.	.10¾–	$0.11
Fullers earth—f..o.b. mines.	ton	18.00 –	20.00
Furfurol, works, bbl.	lb.	.25 –	....
Fusel oil, ref., drums	gal.	.... –	....
Fusel oil, crude, drums	gal.	4.00 –	4.25
Glaubers salt, wks., bags	100 lb.	1.20 –	1.40
Glaubers salt, imp., bags	100 lb.	.90 –	.95
Glycerine, c.p., drums extra	lb.	.16½–	.17
Glycerine, dynamite, drums	lb.	.16 –	....
Glycerine, crude 80%, loose	lb.	.10¾–	....
Iron oxide, red, casks	lb.	.12 –	.18
Lead:			
White, basic carbonate, dry, casks	lb.	.09½–	....
White, basic sulphate, casks	lb.	.09 –	....
White, in oil, kegs	lb.	.11½–	.11¾
Red, dry, casks	lb.	.11½–	.11¾
Red, in oil, kegs	lb.	.13¼–	.14¾
Lead acetate, white crys., bbl.	lb.	.14 –	.14½
Brown, broken, casks	lb.	.13 –	.13½
Lead arsenate, powd., bbl.	lb.	.18 –	.20
Lime-Hydrated, bg, wks.	ton	10.50 –	12.50
Bbl., wks.	ton	18.00 –	19.00
Lime, Lump, bbl	280 lb.	3.63 –	3.65
Litharge, comm., casks	lb.	.10¾–	.10¾
Lithopone, bags	lb.	.06¼–	.06¾
in bbl.	lb.	.06½–	.06¾
Magnesium carb., tech., bags	lb.	.08¼–	.08½
Methanol, 95%, bbl.	gal.	.93 –	....
Methanol, 97%, bbl.	gal.	.95 –	....
Methanol, pure, tanks	gal.	.90 –	....
drums	gal.	1.00 –	....
bbl	gal.	1.05 –	....
Methyl-acetone, t'ks.	gal.	1.15 –	....
Nickel salt, double, bbl.	lb.	.10 –	.10½
Nickel salts, single, bbl.	lb.	.11 –	.11½
Phosgene	....	.60 –	.75
Phosphorus, red, cases	lb.	.... –	....
Phosphorus, yellow, cases	lb.	.35 –	.40
Potassium bichromate, casks	lb.	.09½–	....
Potassium bromide, gran., bbl.	lb.	.19 –	.20
Potassium carbonate, 80-85%, calcined, casks	lb.	.06¼–	.06¾
Potassium chlorate, powd.	lb.	.07½–	.08½
Potassium cyanide, drums	lb.	.47 –	.52
Potassium, first sorts, cask	lb.	.08½–	.08¾
Potassium hydroxide (caustic potash) drums	lb.	.06½–	.06¾
Potassium iodide, cases	lb.	3.65 –	3.75
Potassium nitrate, bbl.	lb.	.07¼–	.09
Potassium permanganate, drums	lb.	.14 –	.14½
Potassium prussiate, red, casks	lb.	.45 –	.48
Potassium prussiate, yellow, casks	lb.	.21½–	.22
Salammoniac, white, gran., casks, imported	lb.	.06¼–	.06¾
Salammoniac, white, gran., bbl., domestic	lb.	.07½–	.07¾
Gray, gran., casks	lb.	.08 –	.09
Salsoda, bbl.	100 lb.	1.20	1.40
Salt cake (bulk)	ton	22.00 –	24.00
Soda ash, light, 58% flat, bulk, contract	100 lb.	1.25 –	....
bags, contract	100 lb.	1.38 –	....
Soda ash, dense, bulk, contract, basis 58%	100 lb.	1.35 –	....
bags, contract	100 lb.	1.45 –	....
Soda, caustic, 76%, solid, drums contract	100 lb.	3.10 –	....
Soda, caustic, ground and flake, contracts, dr	100 lb.	3.50 –	3.85
Soda, caustic, solid, 76% f. a.s. N. Y.	100 lb.	3.10 –	....
Sodium acetate, works, bbl.	lb.	.05 –	.05¼
Sodium bicarbonate, bulk	100 lb.	1.75 –	....
330-lb. bbl.	100 lb.	2.00 –	....
Sodium bichromate, casks	lb.	.07½–	.07¾
Sodium bisulphate (niter cake)	ton	6.00 –	7.00
Sodium bisulphite, powd., U.S.P., bbl.	lb.	.04½–	.04¾
Sodium chlorate, kegs	lb.	.06½–	.07
Sodium chloride long	ton	12.00 –	13.00
Sodium cyanide, cases	lb.	.19 –	.22

Sodium fluoride, bbl.	lb.	$0.08½–	$0.10¾
Sodium hyposulphite, bbl.	lb.	.02½–	.02¾
Sodium nitrite, casks	lb.	.07½–	.07¾
Sodium peroxide, powd., cases	lb.	.28 –	.30
Sodium phosphate, dibasic, bbl.	lb.	.03¾–	.04
Sodium prussiate, yel. drums	lb.	.11 –	.11½
Sodium salicylic, drums	lb.	.40 –	.42
Sodium silicate (40°, drums)	100 lb.	.75 –	1.15
Sodium silicate (60°, drums)	100 lb.	1.75 –	2.00
Sodium sulphide, fused, 60-62% drums	lb.	.03 –	.03½
Sodium sulphite, crys., bbl.	lb.	.03½–	.03¾
Strontium nitrate, powd., bbl.	lb.	.11½–	.12
Sulphur chloride, yel drums.	lb.	.04½–	.05
Sulphur, crude	ton	18.00 –	20.00
At mine, bulk	ton	16.00 –	18.00
Sulphur, flour, bag	100 lb.	2.25 –	2.35
Sulphur, roll, bag	100 lb.	2.00 –	2.10
Sulphur dioxide, liquid, cyl.	lb.	.08 –	.08
Tin bichloride, bbl.	lb.	.13½–	.13¾
Tin oxide, bbl.	lb.	.51 –	....
Tin crystals, bbl.	lb.	.34½–	.35
Zinc carbonate, bags	lb.	.14 –	.14½
Zinc chloride, gran, bbl.	lb.	.06½–	.06¾
Zinc cyanide, drums	lb.	.37 –	.38
Zinc oxide, , lead free, bag	lb.	.06½–	.06¾
5% lead sulphate, bags	lb.	.06¾–	.07⅛
10 to 35 % lead sulphate, bags	lb.	.06½–	.06¾
French, red seal, bags	lb.	.09¼–	......
French, green seal, bags	lb.	.10¾–	......
French, white seal, bbl	lb.	.12 –	......
Zinc sulphate, bbl.	100 lb.	2.75 –	3.25

Coal-Tar Products

Alpha-naphthol, crude, bbl.	lb.	$0.60 –	$0.70
Alpha-naphthol, ref., bbl.	lb.	.65 –	.80
Alpha-naphthylamine, bbl.	lb.	.35 –	.36
Aniline oil, drums	lb.	.16 –	.16½
Aniline salts, bbl.	lb.	.22 –	.23
Anthracene, 80%, drums	lb.	.75 –	.80
Anthracene, 80%, imp., drums, duty paid	lb.	.65 –	.70
Anthraquinone, 25%, paste, drums	lb.	.75 –	.80
Benzaldehyde U.S.P., carboys	lb.	1.50 –	.....
f.f.c. drums	lb.	1.60 –	.....
tech, drums	lb.	75	.....
Benzene, pure, water-white, tanks, works	gal.	.23 –	....
Benzene, 90%, tanks, works	gal.	.21 –	....
Benzidine base, bbl.	lb.	.82 –	.86
Benzidine sulphate, bbl.	lb.	.72 –	.75
Benzoic acid, U.S.P., kegs	lb.	.85 –	88
Benzoate of soda, U.S.P., bbl.	lb.	.65 –	.70
Benzyl chloride, 95-97%, ref., carboys	lb.	.40 –	....
Benzyl chloride, tech., drums	lb.	.25 –	....
Beta-naphthol, tech., bbl.	lb.	.24 –	.25
Beta-naphthylamine, tech.	lb.	.75 –	.80
Cresol, U.S.P., drums	lb.	.25 –	.29
Ortho-cresol, drums	lb.	.28 –	.32
Cresylic acid, 97%, works drums	gal.	.75 –	.85
95-97%, drums, works	gal.	.70 –	.75
Dichlorbenzene, drums	lb.	.06 –	.08
Diethylaniline, drums	lb.	.49 –	.51
Dimethylaniline, drums	lb.	.38 –	.39
Dinitrobenzene, bbl.	lb.	.18 –	.20
Dinitrochlorbenzene, bbl.	lb.	.21 –	.22
Dinitronaphthalen, bbl.	lb.	.30 –	.32
Dinitrophenol, bbl.	lb.	.35 –	.40
Dinitrotoluen, bbl.	lb.	.20 –	.22
Dip oil, 25%, drums	gal.	.30 –	.35
Diphenylamine, bbl.	lb.	.50 –	.52
H-acid, bbl.	lb.	.75 –	.80
Meta-phenylenediamine, bbl.	lb.	1.00 –	1.05
Michlers ketone, bbl.	lb.	3.00 –	3.50
Monochlorbenzene, drums	lb.	.08 –	.10
Monoethylaniline, drums	lb.	.95 –	1.10
Naphthalene, flake, bbl.	lb.	.06½–	.06¾
Naphthalene, balls, bbl.	lb.	.07 –	.07¾
Naphthionate of soda, bbl.	lb.	.60 –	.65
Naphthionic acid, crude, bbl.	lb.	.55 –	.60
Nitrobenzene, drums	lb.	.09 –	.09½
Nitro-naphthalene, bbl.	lb.	.30 –	.35
Nitro-toluene, drums	lb.	.13½–	.14
N-W acid, bbl.	lb.	1.10 –	1.15
Ortho-amidophenol, kegs	lb.	2.30 –	2.35
Ortho-dichlorbenzene, drums	lb.	.15 –	.17
Ortho-nitrophenol, bbl.	lb.	1.20 –	1.30
Ortho-nitrotoluene, drums	lb.	.11 –	.12
Ortho-toluidine, bbl.	lb.	.14 –	.16
Para-amiñophenol, base, kegs	lb.	1.30 –	....
Para-amiñophenol, HCl, kegs	lb.	1.55 –	....
Para-dichlorbenzene, bbl.	lb.	.17 –	.20
Paranitroaniline, bbl.	lb.	.70 –	.73
Para-nitrotoluene, bbl.	lb.	.60 –	.65
Para-phenylenediamine, bbl.	lb.	1.45 –	1.50
Para-toluidine, bbl	lb.	.90 –	.95
Phthalic anhydride, bbl.	lb.	.30 –	.34
Phenol, U.S.P., dr.	lb.	.26 –	.35
Picric acid, bbl.	lb.	.20 –	.22
Pyridine, dom., drums	gal.	nominal	
Pyridine, imp., drums	gal.	4.00 –	4.25
Resorcinol, tech., kegs	lb.	1.40 –	1.50

Resorcinol, pure, kegs	lb.	$2.15 –	....
R-salt, bbl.	lb.	.55 –	.60
Salicylic acid, tech., bbl.	lb.	.32 –	....
Salicylic acid, U.S.P., bbl.	lb.	.35 –	....
Solvent naphtha, water-white, tanks	gal.	.23 –	....
Crude, tanks	gal.	.20 –	....
Sulphanilic acid, crude, bbl.	lb.	.18 –	.20
Thiocarbanilide, kegs	lb.	.35 –	.38
Tolidine, bbl.	lb.	1.00 –	1.05
Toluidine, mixed, kegs	lb.	.30 –	.35
Toluene, tank cars, works	gal.	.24 –	....
Toluene, drums, works	gal.	.29 –	....
Xylidine, drums	lb.	.50 –	....
Xylene, pure, drums	gal.	.45 –	.50
Xylene, com., drums	gal.	.32 –	.34
Xylene, com., tanks	gal.	.27 –	.29

Naval Stores

Rosin B-D, bbl.	280 lb.	$5.80 –	....
Rosin E-I, bbl.	280 lb.	5.85 –	....
Rosin K-N, bbl.	280 lb.	6.25 –	$6.75
Rosin W.G.-W.W., bbl.	280 lb.	7.35 –	7.65
Wood rosin, bbl.	280 lb.	5.80 –	5.90
Turpentine, spirits of, bbl.	gal.	1.04 –	1.05
Wood, steam dist., bbl.	gal.	.84 –	....
Wood, dest. dist., bbl.	gal.	.68 –	....
Pine tar pitch, bbl.	200 lb.	5.50 –	....
Tar, kiln burned, bbl.	500 lb.	11.00 –	....
Retort tar, bbl.	500 lb.	11.00 –	....
Rosin oil, first run, bbl.	gal.	.45 –	....
Rosin oil, second run, bbl.	gal.	.47 –	....
Rosin oil, third run, bbl.	gal.	.50 –	....
Pine oil, steam dist.	gal.	.65 –	....
Pine oil, pure, dest. dist.	gal.	.60 –	....
Pine tar oil, ref.	gal.	.48 –	....
Pine tar oil, crude, tanks f.o.b. Jacksonville, Fla.	gal.	.32 –	.32½
Pine tar oil, double ref., bbl.	gal.	.... –	.75
Pine tar, ref., thin, bbl.	gal.	.... –	.25
Pinewood creosote, ref., bbl.	gal.	.... –	.52

Animal Oils and Fats

Degras, bbl.	lb.	$0.04 –	$0.04¼
Grease, yellow, loose	lb.	.07¼ –	.07⅝
Lard oil, Extra No. 1, bbl.	gal.	.85 –	....
Neatsfootoil 20 deg. bbl.	gal.	1.30 –	....
No. 1, bbl.	gal.	.98 –	....
Oleo Stearine	..	.10 –	....
Oleo oil, No. 1, bbl.	lb.	.16 –	....
Red oil, distilled, d.p. bbl.	lb.	.09½ –	.09¾
Saponified, bbl.	lb.	.09½ –	.09¾
Tallow, extra, loose	lb.	.08½ –	....
Tallow oil, acidless, bbl.	gal.	.86 –	.88

Vegetable Oils

Castor oil, No. 3, bbl.	lb.	$0.14½ –	....
Castor oil, No. 1, bbl.	lb.	.15 –	....
Chinawood oil, bbl.	lb.	.20½ –	.21½
Coconut oil, Ceylon, bbl.	lb.	.10 –	....
Ceylon, tanks, N.Y.	lb.	.08¾ –	....
Coconut oil, Cochin, bbl.	lb.	.10½ –	....
Corn oil, crude, bbl.	lb.	.12 –	....
Crude, tanks, (f.o.b. mill)	lb.	.10 –	....
Cottonseed oil, crude (f.o.b. mill), tanks	lb.	.09½ –	.09¾
Summer yellow, bbl.	lb.	.11½ –	.12
Winter yellow, bbl.	lb.	.12½ –	.13
Linseed oil, raw, car lots, bbl.	gal.	.91 –	....
Raw, tank cars (dom.)	gal.	.85 –	....
Boiled, cars, bbl. (dom.)	gal.	.93 –	....
Olive oil, denatured, bbl.	gal.	1.10 –	1.12
Sulphur, (foots) bbl.	lb.	.09½ –	....
Palm, Lagos, casks	lb.	.08 –	....
Niger, casks	lb.	.07½ –	.07½
Palm kernel, bbl.	lb.	.09 –	....
Peanut oil, crude, tanks (mill)	lb.	.12 –	....
Peanut oil, refined, bbl.	lb.	.15 –	.15½
Perilla, bbl.	lb.	.14½ –	.14¾
Rapeseed oil, refined, bbl.	gal.	.77 –	.79
Rapeseed oil, blown, bbl.	gal.	.83 –	.85
Sesame, bbl.	lb.	.12½ –	.12½
Soya bean (Manchurian), bbl.	lb.	.... –	....
Tank, f.o.b. Pacific coast	lb.	.10 –	....
Tank, (f.o.b. N.Y.)	lb.	.10½ –	....

Fish Oils

Cod, Newfoundland, bbl.	gal.	$0.68 –	....
Menhaden, light pressed, bbl.	gal.	.65 –	....
White bleached, bbl.	gal.	.67 –	....
Blown, bbl.	gal.	.71 –	....
Crude, tanks (f.o.b. factory)	gal.	.47½ –	....
Whale No. 1 crude, tanks, coast	lb.	.... –	....
Winter, natural, bbl.	gal.	.75 –	.76
Winter, bleached, bbl.	gal.	.78 –	.79

Oil Cake and Meal

Coconut cake, bags	ton	$34.00 –	....
Cottonseed meal, f.o.b. mills	ton	45.00 –	....
Linseed cake, bags	ton	41.00 –	....
Linseed meal, bags	ton	44.00 –	....

Dye & Tanning Materials

Albumen, blood, bbl.	lb.	$0.45 –	$0.50
Albumen, egg, tech, kegs	lb.	.95 –	.97
Cochneal, bags	lb.	.32 –	.34
Cutch, Borneo, bales	lb.	.04½ –	.04¾
Cutch, Rangoon, bales	lb.	.15 –	.16
Dextrine, corn, bags	100 lb.	3.59 –	3.69
Dextrine, gum, bags	100 lb.	3.89 –	3.99
Divi-divi, bags	ton	38.00 –	39.00
Fustic, sticks	ton	30.00 –	35.00
Fustic, chips, bags	lb.	.04 –	.05
Gambier com., bags	lb.	.10½ –	.10½
Logwood, sticks	ton	25.00 –	26.00
Logwood, chips, bags	lb.	.02½ –	.03
Sumac, leaves, Sicily, bags	ton	90.00 –	.....
Sumac, gruond, bags	ton	$85.00 –	$90.00
Sumac, domestic, bags	ton	40.00 –	42.00
Starch, corn, bags	100 lb.	3.02 –	3.12
Tapioca flour, bags	lb.	.06 –	.07

Extracts

Archil, conc., bbl.	lb.	$0.16½ –	$0.20
Chestnut, 25% tannin, tanks	lb.	.02 –	.03
Divi-divi, 25% tannin, bbl.	lb.	.04 –	.05
Fustic, crystals, bbl.	lb.	.20 –	.22
Fustic, liquid, 42°, bbl.	lb.	.08 –	.09
Gambier, liq., 25% tannin, bbl.	lb.	.09 –	.09½
Hematine crys., bbl.	lb.	.14 –	.18
Hemlock, 25% tannin, bbl.	lb.	.03½ –	.04
Hypernic, solid, drums	lb.	.24 –	.26
Hypernic, liquid, 51°, bbl.	lb.	.09½ –	.10½
Logwood, crys., bbl.	lb.	.14 –	.15
Logwood, liq., 51°, bbl.	lb.	.08 –	.09
Quebracho, solid, 65% tannin, bbl.	lb.	.05 –	.05½
Sumac, dom., 51°, bbl.	lb.	.06½ –	.07½

Dry Colors

Blacks-Carbongas, bags, f.o.b. works, contract	lb.	$0.08 –	$0.10
spot, cases	lb.	.10 –	.14
Lampblack, bbl.	lb.	.12 –	.40
Mineral, bulk	ton	35.00 –	45.00
Blues-Bronze, bbl.	lb.	.45 –	.50
Prussian, bbl.	lb.	.45 –	.50
Ultramarine, bbl.	lb.	.08 –	.35
Browns, Sienna, Ital., bbl.	lb.	.06 –	.14
Sienna, Domestic, bbl.	lb.	.03½ –	.04
Umber, Turkey, bbl.	lb.	.04 –	.04½
Greens-Chrome, C.P. Light, bbl.	lb.	.28 –	.30
Chrome, commercial, bbl.	lb.	.12 –	.12½
Paris, bulk	lb.	.26 –	.28
Reds Carmine No. 40, tins	lb.	4.50 –	4.70
Oxide red, casks	lb.	.10 –	.14
Para toner, kegs	lb.	1.00 –	1.10
Vermilion, English, bbl.	lb.	1.15 –	1.20
Yellow, Chrome, C.P. bbls.	lb.	.17½ –	.18
Ocher, French, casks	lb.	.02½ –	.03

Waxes

Bayberry, bbl.	lb.	$0.25 –	$0.26
Beeswax, crude, Afr. bg.	lb.	.22 –	....
Beeswax, refined, light, bags	lb.	.32 –	.34
Beeswax, pure white, cases	lb.	.40 –	.41
Candellila, bags	lb.	.23 –	.23½
Carnauba, No. 1, bags	lb.	.36 –	.38
No. 2, North Country, bags	lb.	.22 –	.22½
No. 3, North Country, bags	lb.	.18½ –	.19
Japan, cases	lb.	.17½ –	.17½
Montan, crude, bags	lb.	.05¾ –	.06
Paraffine, crude, match, 105-110 m.p., bbl.	lb.	.04½ –	....
Crude, scale 124-126 m.p. bags	lb.	.03½ –	....
Ref., 118-120 m.p., bags	lb.	.04 –	....
Ref., 125 m.p., bags	lb.	.04½ –	....
Ref, 128-130 m.p., bags	lb.	.04½ –	....
Ref., 133-135 m.p., bags	lb.	.04¾ –	.05
Ref., 135-137 m.p., bags	lb.	.05½ –	....
Stearic acid, sgle pressed, bags	lb.	.11½ –	.11¾
Double pressed, bags	lb.	.12 –	.12½
Triple pressed, bags	lb.	.13 –	.13½

Fertilizers

Acid phosphate, 16%, bulk, works	ton	$8.00 –	$8.25
Ammonium sulphate, bulk f.o.b. works	100 lb.	2.85 –	2.90
Blood, dried, bulk	unit	4.10 –	4.15
Bone, raw, 3 and 50, ground	ton	26.00 –	28.00
Fish scrap, dom., dried, wks.	unit	4.40 –	....
Nitrate of soda, bags	100 lb.	2.50 –	....
Tankage, high grade, f.o.b. Chicago	unit	3.25 –	3.35
Phosphate rock, f.o.b. mines, Florida pebble, 68-72%	ton	4.00 –	4.50
Tennessee, 78-80%	ton	7.75 –	8.00
Potassium muriate, 80%, bags	ton	34.55 –	....
Potassium sulphate, bags basis 90%	ton	45.85 –	....
Double manure salt	ton	27.00 –	....
Kainit	ton	7.22 –	....

Crude Rubber

Para—Upriver fine	lb.	$0.22½ –	....
Upriver coarse	lb.	.18½ –	....
Upriver caucho ball	lb.	.20 –	....
Plantation—First latex crepe	lb.	.26½ –	....
Ribbed smoked sheets	lb.	.26¾ –	....
Brown crepe, thin, clean	lb.	.24½ –	....
Amber crepe No. 1	lb.	.25½ –	....

Gums

Copal, Congo, amber, bags	lb.	$0.10 –	$0.15
East Indian, bold, bags	lb.	.20 –	.21
Manila, pale, bags	lb.	.19 –	.20
Pontinak, No. 1 bags	lb.	.19 –	.20
Damar, Batavia, cases	lb.	.25 –	....
Singapore, No. 1, cases	lb.	.32 –	.33
Singapore, No. 2, cases	lb.	.21½ –	.22
Kauri, No. 1, cases	lb.	.64 –	.66
Ordinary chips, cases	lb.	.20½ –	.21½
Manjak, Barbados, bags	lb.	.09 –	.14

Shellac

Shellac, orange fine, bags	lb.	$0.64 –	....
Orange superfine, bags	lb.	.66 –	....
A. C. garnet, bags	lb.	.65 –	....
Bleached, bonedry	lb.	.72 –	.73
Bleached, fresh	lb.	.60 –	....
T. N., bags	lb.	.60 –	.61

Miscellaneous Materials

Asbestos, crude No. 1, f.o.b., Quebec	sh. ton	$325.00 –	$450.00
Asbestos, shingle, f.o.b., Quebec	sh. ton	50.00 –	70.00
Asbestos, cement, f.o.b., Quebec	sh. ton	17.00 –	20.00
Barytes, grd., white, f.o.b. mills, bbl.	net ton	16.00 –	17.00
Barytes, grd., off-color, f.o.b. Balt.	net ton	13.00 –	14.00
Barytes, floated, f.o.b. St. Louis, bbl.	net ton	26.00 –	.....
Barytes, crude f.o.b. mines, bulk	net ton	7.00 –	10.00
Casein, bbl., tech.	lb.	.11 –	.12
China clay (kaolin) crude, No. 1, f.o.b. Ga.	net ton	8.50 –	10.00
Washed, f.o.b. Ga.	net ton	8.00 –	9.00
Powd., f.o.b. Ga.	net ton	13.00 –	20.00
Crude f.o.b. Va.	net ton	6.00 –	8.00
Ground, f.o.b. Va.	net ton	13.00 –	19.00
Imp., lump, bulk	net ton	15.00 –	20.00
Imp., powd.	net ton	45.00 –	50.00
Feldspar, No. 1 f.o.b. N.C.	long ton	6.60 –	7.75
No. 2 f.o.b. N.C.	long ton	4.50 –	5.00
No. 1 soap	long ton	8.50 –	....
No. 1 Canadian, f.o.b. mill, powd.	long ton	20.00 –	....
Graphite, Ceylon, lump, first quality, bbl.	lb.	.05½ –	.06
Ceylon, chip, bbl.	lb.	.04½ –	.05
High grade amorphous crude	ton	15.00 –	30.00
Gum arabic, amber, sorts, bags	lb.	.13 –	.13½
Gum tragacanth, sorts, bags	lb.	.50 –	.55
No. 1, bags	lb.	1.35 –	1.40
Kieselguhr, f.o.b. Cal.	ton	40.00 –	42.00
F.o.b. N. Y.	ton	50.00 –	55.00
Magnesite, crude, f.o.b. Cal.	ton	14.00 –	15.00
Pumice stone, imp., casks	lb.	.03 –	.05½
Dom., lump, bbl.	lb.	.05 –	.05½
Dom., ground, bbl.	lb.	.05½ –	.06
Silica, glass sand, f.o.b. Ind.	ton	2.00 –	2.50
Silica, sand blast, f.o.b. Ind.	ton	2.25	3.50
Silica, amorphous, 200-mesh, f.o.b. Ill.	ton	20.00 –	....
Silica, glass sand, f.o.b. Ill.	ton	1.75 –	3.00
Soapstone, coarse, f.o.b. Vt., bags	ton	7.00 –	8.00
Talc, 200 mesh, f.o.b., Vt., bags, extra	ton	8.00 –	8.50
Talc, 200 mesh, f.o.b. Ga., bags	ton	8.00 –	9.00
Talc, 350 mesh, f.o.b. New York, grade A bags	ton	22.00 –	....

Mineral Oils

Crude, at Wells

Pennsylvania	bbl.	$3.00 –	$3.25
Corning	bbl.	1.55 –	......
Cabell	bbl.	1.45 –	......
Somerset	bbl.	1.40 –	......
Illinois	bbl.	1.42 –	......
Indiana	bbl.	1.43 –	......
Kansas and Okla. under 28deg.	bbl.	.50 –	......
California, 35 deg. and up	bbl.	.76 –	......

Gasoline, Etc.

Motor gasoline, steel bbls.	gal.	$0.15½ –	......
Naphtha, V. M. & P. deod, steel bbls.	gal	.14½ –	......
Kerosene, ref. tank wagon	gal.	.15 –	......
Bulk, W.W. delivered, N.Y.	gal.	.09½ –	......
Lubricating oils:			
Cylinder, Penn., dark	gal.	.26 –	....
Bloomless, 30@31 grav.	gal.	.17½ –	....
Paraffin, pale	gal.	.16 –	.16½
Spindle, 200, pale	gal.	.21 –	.21½
Petrolatum, amber, bbls.	lb.	.03½ –	.04½
Paraffine wax (see waxes)			

Refractories

Bauxite brick, 56% Al_2O_3, f.o.b. Pittsburgh	1,000	$140–145
Chrome brick, f.o.b. Eastern shipping points	ton	45–47
Chrome cement, 40-50% Cr_2O_3	ton	23–27
40-45% Cr_2O_3, sacks, f.o.b. Eastern shipping points	ton	23.00
Fireclay brick, 1st. quality, 9-in. shapes, f.o.b. Ky. wks.	1,000	42–45
2nd. quality, 9-in. shapes, f.o.b. wks.	1,000	35–38
Magnesite brick, 9-in. straight (f.o.b. wks.)	ton	65–68
9-in. arches, wedges and keys	ton	80–85
Scraps and splits	ton	85
Silica brick, 9-in. sizes, f.o.b. Chicago district	1,000	50–53
Silica brick, 9-in. sizes, f.o.b. Birmingham district	1,000	50–53
F.o.b. Mt. Union, Pa.	1,000	42–45
Silicon carbide refract. brick, 9-in.	1,000	1180.00

Ferro-Alloys

Ferrotitanium, 15-18% f.o.b. Niagara Falls, N.Y.	ton	$200.00 –	$225.00

Ferrochromium, per lb. of Cr, 1-2% C	lb.	$0.30 –	....
4-6% C	lb.	.12 –	....
Ferromanganese, 78-82% Mn, Atlantic seabd. duty paid	gr. ton	109.00 –	....
Spiegeleisen, 19-21% Mn	gr. ton	40.00 –	....
Ferromolybdenum, 50-60% Mo, per lb. Mo	lb.	2.00 –	2.50
Ferrosilicon, 10-12%	gr. ton	43.00 –	50.00
50%	gr. ton	82.50 –	85.00
Ferrotungsten, 70-80%, per lb. of W	lb.	.88 –	.95
Ferro-uranium, 35-50% o U. per lb. of U	lb.	4.50 –	....
Ferrovanadium, 30-40% per lb. of V	lb.	3.50 –	4.00

Ores and Semi-finished Products

Bauxite, dom. crushed dried, f.o.b. shipping points	ton	$5.50 –	$8.75
Chrome ore, Calif. concentrates, 50% min. Cr_2O_3	ton	22.00 –	23.00
C.i.f. Atlantic seaboard	ton	19.50 –	21.50
Coke, fdry., f.o.b. ovens	ton	5.00 –	5.50
Coke, furnace, f.o.b. ovens	ton	3.75 –	4.00
Fluorspar, gravel, f.o.b. mines' Illinois	ton	23.50 –	....
Ilmenite, 52% TiO_2	lb.	.00¾–	.01
Manganese ore, 50% Mn c.i.f. Atlantic seaport	unit	.38 –	.42
Manganese ore, chemical (MnO_2)	ton	75.00 –	80.00
Molybdenite, 85% MoS_2, per lb. MoS_2, N. Y.	lb.	.80 –	....
Monazite, per unit of ThO_2, c.i.f., Atl. seaport	lb.	.06 –	.08
Pyrites, Span., fines, c.i.f Atl. seaport	unit	.11½–	.12
Pyrites, Span., furnace size c.i.f. Atl. seaport	unit	.11½–	.12
Pyrites, dom. fines, f.o.b. mines, Ga.	unit	.12 –	....
Rutile, 95% TiO_2	lb.	.10 –	....
Tungsten, scheelite, 60% WO_3 and over	unit	9.50 –	10.00
Tungsten, wolframite, 60% WO_3	unit	8.50 –	9.00
Uranium ore (carnotite) per lb. of U_3O_8	lb.	3.50 –	3.75
Uranium oxide, 96% per lb. U_3O_8	lb.	2.25 –	2.50
Vanadium pentoxide, 99%	lb.	12.00 –	14.00
Vanadium ore, per lb. V_2O_5	lb.	1 00 –	1.25
Zircon	ton	50.00 –	....

Non-Ferrous Metals

Copper, electrolytic	lb.	$0.12½–$0.12¾
Aluminum, 98 to 99%	lb.	.26 – .27
Antimony, wholesale, Chinese and Japanese	lb.	.10 – .10½
Nickel, 99%	lb.	.27 – .30
Monel metal, shot and blocks	lb.	.32
Monel metal, ingots	lb.	.38
Monel metal, sheet bars	lb.	.45
Tin, 5-ton lots, Straits	lb.	.48½
Lead, New York, spot	lb.	7.90
Lead, E. St. Louis, spot	lb.	7.90
Zinc, spot, New York	lb.	.06¾
Zinc, spot, E. St. Louis	lb.	.06425
Silver (commercial)	oz.	.63¾
Cadmium	lb.	.75@ .80
Bismuth (500 lb. lots)	lb.	2.55
Cobalt	lb.	3.00-3.25
Magnesium, ingots, 99%	lb.	.90–.95
Platinum	oz.	125.00
Iridium	oz.	275.00–300.00
Palladium	oz.	83.00
Mercury	75 lb.	60.00
Tungsten	lb.	.90–.95

Finished Metal Products

	Warehouse Price Cents per Lb.
Copper sheets, hot rolled	19.50
Copper bottoms	29.50
Copper rods	20.00
High brass wire	18.00
High brass rods	15.50
Low brass wire	20.00
Low brass rods	20.50
Brazed brass tubing	23.50
Brazed bronze tubing	25.00
Seamless copper tubing	23.50
Seamless high brass tubing	22.00

OLD METALS—The following are the dealers purchasing prices in cents per pound:

Copper, heavy and crucible	10.00 @ 10.25
Copper, heavy and wire	9.87½@ 10.00
Copper, light and bottoms	8.00 @ 8.25
Lead, heavy	6.62½@ 6.87½
Lead, tea	3.62½@ 3.87½
Brass, heavy	5.25 @ 5.50
Brass, light	4.50 @ 4.75
No. 1 yellow brass turnings	5.00 @ 5.12½
Zinc scrap	3.75 @ 4.00

Structural Material

The following base prices per 100 lb. are for structural shapes 3 in. by ¼ in. and larger, and plates ¼ in. and heavier, from jobbers' warehouses in the cities named:

	New York	Chicago
Structural shapes	$3.54	$3.54
Soft steel bars	3.54	3.54
Soft steel bar shapes	3.54	3.54
Soft steel bands	4.39	4.39
Plates, ¼ to 1 in. thick	3 64	3.64

Industrial

Financial, Construction and Manufacturing News

Construction and Operation

Arkansas

FORT SMITH—The Ball Brothers Co., Muncie, Ind., manufacturer of fruit jars, tumblers and other glass containers, has acquired a tract of about 25 acres of land at Fort Smith, and has tentative plans for the erection of a new branch plant, with reported cost in excess of $85,000, including equipment.

ARKANSAS CITY—The Roxana Petroleum Corp., Arcade Bldg., St. Louis, Mo., has preliminary plans for the construction of two additional units at its recently established oil-refining plant at Arkansas City, with capacity for handling about 8,000 to 10,000 bbl. crude oil per day.

CAMDEN—The Houston Oil Co., Camden, and Houston, Tex., has completed plans and will commence immediately the erection of a local refinery for the production of gasoline and kerosene, using the "cracking" process. It will consist of a number of units with capacity of 5,000 bbl. per day, estimated to cost close to $700,000, with machinery. It is purposed to give employment to about 150 men.

FAYETTEVILLE—H. Edward Smith, P. O. Box 522, and associates plan for the installation of a plant on neighboring tract of 400 acres of land, with lead, zinc and gold deposits. Hoisting machinery, grinding and washing equipment, power apparatus and other equiment will be installed.

California

LOS ANGELES—The Los Angeles Soap Co., 633 East 1st St., manufacturer of soaps, washing powders, refined cottonseed oils, etc., has plans nearing completion and will soon take bids for a new 4-story plant, to be located on East 1st St., near Alameda St., 130x130 ft., estimated to cost $175,000, including equipment. Morgan, Walls & Clements, Van Nuys Bldg., are architects.

LONG BEACH—The Bay Hills Pipe Line & Storage Co. plans for the early construction of a local oil storage and distributing plant at the harbor, to cost more than $1,-200,000, with machinery, tanks, etc.

SAN FRANCISCO—The Bristol Myers Co., manufacturer of chemical specialties, plans for the establishment of a new works, following the destruction by fire late in December of the 6-story structure at 2nd and Mission Sts., where the company maintained a plant, entirely destroyed.

SAN DIEGO—The San Diego Consolidated Gas & Electric Co. is arranging an appropriation for extensions and improvements in its artificial gas plants during the present year, including the installation of additional equipment. A portion of a $500,000 preferred stock issue will be used.

CHULA VISTA—The San Diego Cottonseed Oil Products Co. has tentative plans for the rebuilding of the portion of its local mill, recently destroyed by fire, with loss estimated at $350,000, with equipment.

Connecticut

WEST HAVEN—The Connecticut Fat Rendering & Fertilizer Co. has awarded a contract to Pratt & Madison, New Haven, for the construction of a 1-story, top addition to its plant, 60x90 ft., on which work will be commenced at once. Westcott & Mapes, Inc., New Haven, is engineer.

Florida

CROOM—Clarence Nelson, Bartow, Fla., has acquired a local fertilizer plant and will operate in the future. Extensions and improvements are under consideration, including the installation of additional equipment.

Georgia

MOULTRIE—J. A. Kelly, Mount Pleasant, Mich., has acquired local property and plans for the construction of a pottery for the manufacture of earthenware and porcelain specialties. The initial plant is expected to cost about $35,000. It is said that a company will be formed to carry out and operate the project.

VALDOSTA—The Walker Pine Products Co. has tentative plans for the construction of an addition to its plant, estimated to cost about $100,000, including machinery. It is purposed to provide facilities for extensive increase in output.

Illinois

LA SALLE—The Carus Chemical Works, 1375 8th St., Edward Carus, president, is considering plans for the construction of a new plant on local site, to be equipped for the manufacture of zinc oxide. It is estimated to cost in excess of $80,000. Bids will be called early in the spring.

CHICAGO—Darling & Co. Inc., 4201 South Ashland Ave., manufacturer of fertilizer products, is taking bids for the erection of a 2-story works, 44x70 ft., at Racine Ave. and West 45th St., to replace a portion of its plant destroyed by fire several months ago. It will cost about $60,000. Bids are also being taken for a 1-story plant building, 61x113 ft., at 44th Place and Cook St., to cost approximately $23,000, and estimates will be called on another structure in the near future. S. J. Riley is company architect. C. A. Alling is president.

Indiana

WHITING—The Standard Oil Co. of Indiana, Indianapolis, is considering tentative plans for the rebuilding of the portion of its refining and mechanical plant at Whiting, destroyed by fire, Jan. 1, with loss estimated at close to $750,000, including equipment.

Iowa

MASON CITY — The Lehigh Portland Co., Allentown, Pa., is reported to be planning for the construction of a local mill, on site selected near the city limits, to cost in excess of $100,000.

Maine

PORTLAND—The New England Explosives Co., Edward L. Fenn, Wood St., Lexington, Mass., president, has preliminary plans under way for the construction of a new local plant for the manufacture of dynamite and other explosive products, with reported cost placed at $70,000.

Maryland

CUMBERLAND—The C. A. Borchert Co., 127 North Center St., recently organized, will operate a local plant for the manufacture of cut glass products. The company plans for the early installation of equipment, including cutting machines, and auxiliary apparatus.

Michigan

DETROIT—The Howe-Martz Glass Co., 930 Monroe Ave., has completed plans and is taking bids for the erection of a 1-story addition to its plant, 75x140 ft., on Monroe Ave. near Hastings St., estimated to cost $55,000. J. J. Murphy is engineer for the company.

CHARLEVOIX—The State Highway Department, Lansing, is said to have tentative plans under advisement for the erection of a new cement mill on local site, to be state-owned and operated. It is expected to cost in excess of $200,000, with machinery.

Mississippi

MOSS POINT—The Southern Paper Co. has work under way on enlargements and improvements in its local mill, to include the installation of additional equipment for increased capacity. The plant will be completely electrified in all departments, replacing present steam-operated apparatus.

Missouri

ST. LOUIS—The St. Louis Terra Cotta Co., 5811 Manchester Ave., has preliminary plans under way for the erection of a new plant at 4417-31 Oleatha Ave., to be 1-story, estimated to cost approximately $100,000, equipped for the production of terra cotta specialties. It is expected to take bids in the near future.

KANSAS CITY—The Dean Rubber Co., 13th and Chestnut Sts., is taking bids for the construction of its proposed 1- and 2-story plant at 16th and Lyolia Sts., North Kansas

City, estimated to cost $50,000, including equipment. It is expected to break ground at an early date. W. J. Dean is president.

Montana

JARDINE—F. W. and H. C. Bacorn, Jardine, near Butte, operating a local arsenic plant, have commenced enlargements and will install equipment to double approximately the present capacity.

New Jersey

METUCHEN—The Sepoy Color & Chemical Co., Durham Ave., has tentative plans under advisement for the rebuilding of the portion of its local plant destroyed by fire, Jan. 3, with loss estimated at $50,000, including machinery.

NEWARK—The United Color & Pigment Co., Evergreen Ave., manufacturer of paint pigments, dry colors, etc., has awarded a general contract to Joseph Jewkes & Son, 876 Montgomery St., Jersey City, N. J., for the erection of a 1- and 2-story addition, 80x205 ft., estimated to cost $60,000. Plans have been filed and work will commence at once. The company also plans for the construction of another addition at a later date to cost about $10,000.

TRENTON—The Thomas Maddock's Sons Co., Perry and Ewing Sts., manufacturer of sanitary ware, is concluding negotiations for the purchase of a tract of land at Hutchinson's Mills, Hamilton Township, near Trenton, as a site for a new plant. The company purposes to construct a complete pottery on the property, including a number of units, and later to remove its present works to this location. The project is expected to involve more than $500,000. Archibald M. Maddock is president, and C. S. Maddock treasurer.

New York

EDWARDS—The New York Zinc Co. has acquired the local property, concentrating mills and other buildings of the Northern Ore Co. and will operate the plant in the future. Plans are under consideration for extensions, including the installation of additional equipment. T. I. Crane is president of the purchasing company, and Frank B. Haley secretary and treasurer.

BUFFALO—The United States Rubber Co., Broadway and 58th St., New York, has leased for a factory and distributing branch a new 4-story building, totaling about 115,000 sq.ft. of floor space, to be erected at 133 Swan St., Buffalo, costing approximately 150,000. It is expected to be ready for occupancy early in the spring.

HAMBURG—Spencer Lens Co. has extensions and improvements under way at its plant, including the reconstruction of furnaces and other equipment, and plans to have the works ready for capacity production at an early date, with facilities to give employment to about 150 persons.

Ohio

WOOSTER—The Ohio Agricultural Experiment Station has taken bids and plans to award a general contract before the close of the month for the erection of a 2-story chemistry building at the institution, for which an appropriation of $75,000, is available.

Pennsylvania

PHILADELPHIA—The Crescent Ink & Color Co., 408 Vine St., has concluded the purchase of property at 460-64 North 5th St., at Hamilton St., for site for its proposed new plant, comprising a 1- and 2-story building, to cost in excess of $50,000. Philip S. Tyre, 1509 Arch St., is architect.

COPLAY—The Giant Portland Cement Co., Pennsylvania Bldg., Philadelphia, Pa., plans for the rebuilding of the portion of its plant near Coplay, destroyed by fire, Dec. 29, with loss estimated at $50,000. The bulk of the damage was sustained by the packing plant.

PHILADELPHIA — The Quaker Industrial Alcohol Co., Inc., Bartram Ave. and 82nd St., plans for the construction of a new tank house at its plant, estimated to cost approximately $17,000.

BEAVER DAM—The General Paper Co. will make improvements in its plant, including the installation of equipment for the complete electrification of the mill, replacing all present steam-operated apparatus.

MCKEESPORT — The National Tube Co., Frick Bldg., Pittsburgh, a subsidiary of the United States Steel Corp., has secured an appropriation of $1,500,000, for extensions and improvements in its local plant, of which about $1,000,000 will be used for the installation of a new blast furnace.

South Carolina

CAMDEN—J. H. Anderson, Route 4, P. O. Box 5, has plans under way for the installation of a local plant for the manufacture of cement and concrete brick and kindred products, and will purchase machinery and power equipment in the near future.

Tennessee

KNOXVILLE — The Burdett Oxygen Co., Chattanooga, Tenn., has secured a local site and is perfecting plans for the erection of a new plant for the manufacture of liquid oxygen, estimated to cost close to $100,000, including equipment. E. A. Faulhaber is vice-president.

Virginia

BEDFORD — The Bedford Tire & Rubber Co., recently organized, has arranged an appropriation of about $75,000 for the purchase of machinery and operating equipment for its proposed local plant, for which plans are nearing completion. It will be 80x300 ft., and will cost approximately $35,000, in addition to amount noted. It is expected to develop an initial output of 1,000 tires per day. J. J. Scott is secretary and treasurer.

Washington

SEATTLE — The Pacific Nitrogen Co. is completing plans for the construction of a new plant at Lake Union, in the vicinity of its present works, estimated to cost approximately $250,000, with equipment. The company is affiliated with the Pacific Ammonia & Chemical Co., Seattle.

BELLINGHAM—The Utah-Idaho Sugar Co., Salt Lake City, Utah, is said to be consummating arrangements for the purchase of a site in this viicnity for the construction of a new beet sugar refining mill. The plant will comprise a number of units, and is estimated to cost close to $1,000,000, with machinery.

New Companies

COCHRANE CHEMICAL CO., Jersey City, N. J.; chemicals and chemical byproducts; $100,000. Incorporators: U. L. Edwards, Martin J. Bevans and Samuel Cochrane, 432 Danforth Ave., Jersey City. The last noted is representative.

NATIONAL BOX BOARD CO., Grand Rapids, Mich.; paper, paperboard and boxboard; $2,475,000. Incorporators: Harry C. Angell, A. H. Apted and J. M. Alt, 561 Turner Ave., Grand Rapids. The last noted is representative.

JOHNSON CLAY WORKS, INC., Fort Dodge, Ia.; tile, earthenware and other burned clay products; $600,000. Incorporators: D. G. and William Johnston, both of Fort Dodge.

EDMONDSON-WARRIN, INC., New York, N. Y.; glass products; $100,000. Incorporators: P. M. Preater, G. Verneuil and C. E. Ayres. Representative: J. W. Spencer, 32 Nassau St., New York.

REFINERS' OIL CO., Richmond, Ind.; refined petroleum and byproducts; $200,000. Incorporators: R. M. and R. S. King, W. E. Talbot and F. S. Parrott, all of Richmond.

BALTIMORE DECOLORIZER CO., Baltimore, Md.; decolorizers for use in the production of glassware, etc.; $25,000. Incorporators: Harry A. Richards and George O. Smith, 1403 Fidelity Bldg., Baltimore.

KESSLER CHEMICAL CO., Orange, N. J.; chemicals and chemical byproducts; $200,000. Incorporators: John M. Kessler, John J. McCue and Oregon B. Helfrich, 575 Nassau St., Orange. The last noted is representative.

COMMERCIAL COLOR & CHEMICAL CO., 23 Mathewson St., Providence, R. I.; organized; colors, chemicals and affiliated products. Edwin Davenport, Jr., heads the company.

AMERICAN FERROLIT CORP., New York, N. Y.; chemicals and chemical byproducts; $10,000. Incorporators: E. V. Reiss and V. Samelson. Representative: H. L. Slododin, 1465 Broadway, New York.

MCSHANE-LITTLE CO., Los Angeles, Calif.; paints, varnishes, oils, etc.; $100,000. Incorporators: Clarence E. McShane, Olin W. Little and David P. Hatch, 1121 Van Nuys Bldg., Los Angeles. The last noted is representative.

INGALLS LEATHER CO., Boston, Mass.; leather products; $100,000. Incorporators: Thomas W. Ingalls and Maurice Yozell, 386 Humphrey St., Swampscott, Mass. The last noted is treasurer and representative.

BLOCH BROTHERS PAPER CO., New York, N. Y.; paper products; $30,000. Incorporators: C., H., and B. Bloch. Representative: G. B. Garfield, 42 Broadway, New York.

F. S. CORP., 15 Exchange Pl., Jersey City, N. J.; cottonseed oil products; $50,000. Incorporators: George C. Sharp, William K. Laws and Arthur H. Dean.

FEDERAL FERTILIZER CO., Augusta, Me.; fertilizer products; 1,000 shares of stock, no par value. E. M. Leavitt is president; E. F. Porter, treasurer; and Ernest L. McLean, Augusta, clerk and representative.

COSTLEY-NEWMAN PAINT CO., Redondo Beach, Calif.; paints and varnishes; $10,000. Incorporators: A. H. Costley and C. C. Newman, both of Redondo Beach.

NITROGEN ENGINEERING CORP., New York, N. Y.; nitrogen, chemicals, etc.; 1,000 shares of stock, no par value. Incorporators: R. Bennett, Jr., P. D. Bernard and P. G. Brennan. Representatives: Wing & Russell, 14 Wall St., New York.

PECKHAM BRASS FOUNDRY, INC., Boston, Mass.; brass and bronze castings; $10,000. Gustavus H. Sparrow, 10 Willow St., Belmont, Mass., is president and treasurer.

WESTPORT CHEMICAL CORP., Evergreen Ave., Westport, Conn.; chemicals and chemical byproducts; capital stock not given. Percy E. Anderson is president, and William E. Ripley secretary and treasurer, both of Westport.

NATIONAL CHEMICAL CO., Camden, N. J., care of the New Jersey Corporation Guarantee & Trust Co., 304 Market St., Camden, representative; chemicals and chemical byproducts; $125,000.

EDGECOMB STEEL CO., Philadelphia, Pa.; steel products; $200,000. Leslie Edgecomb, Cynwyd, Pa., is treasurer and representative.

GENSEMER & SALEN, INC., Pine Grove, Pa.; to operate a leather tannery; $9,000. George W. Gensemer, Pine Grove, is treasurer and representative.

PYRAMID FERTILIZER & CHEMICAL CO., San Francisco, Calif.; chemicals, fertilizer products, etc.; $500,000. Incorporators: J. M. Schumann, Timothy Pearson and E. Gartley Masson. Representative: Harry F. Davis, Hobart Bldg., San Francisco.

Z. & W. M. CRANE, INC., Dalton, Mass.; paper products, taking over existing mills and property; $2,000,000. William C. O'Connell, president, and Theodore M. Pomeroy, Dalton, treasurer.

Industrial Notes

THE ARMSTRONG CORK & INSULATION CO., Pittsburgh, Pa., has moved the Minneapolis Office to 316-318-320 Third Ave., North. These quarters are much larger than the old ones and provide increased warehouse facilities.

THE SWENSON EVAPORATOR CO., Harvey, Ill., has recently added to its Eastern sales staff H. B. Caldwell, chemical engineer, formerly assistant plant superintendent for Zinsser & Co., Hastings-on-Hudson, N. Y. Mr. Caldwell is a graduate of Massachusetts Institute of Technology. He will work with P. B. Sadtler, who is in charge of the Swenson sales offices located at 1228 Spruce St., Philadelphia, and 136 Liberty St., New York City. It is also announced that the Philadelphia sales office, formerly located at 1309 Weidner Bldg., has been moved to 1228 Spruce St.

Opportunities in the Foreign Trade

Parties interested in any of the following opportunities may obtain all available information from the Bureau of Foreign and Domestic Commerce at Washington or from any district office of the bureau. The number placed after the opportunity must be given for the purpose of identification.

CARBON BLACK. Dublin, Ireland. Purchase and agency.—8770.

CAUSTIC SODA. Rio de Janeiro, Brazil. Agency.—8772.

PHARMACEUTICAL SPECIALTIES. Havana, Cuba. Purchase and agency.—8771.

TURPENTINE AND PITCH. Rio de Janeiro, Brazil. Agency.—8772.

OIL, NEATSFOOT. Bordeaux, France. Purchase.—8767.

OLEO STOCK. Goteborg, Sweden. Purchase and agency.—8784.

GASOLINE, in shipments of 400 to 1,000 tons. Vienna, Austria. Purchase.—8792.

WINDOW GLASS. Stoke-on-Trent, England. Agency.—8779.